Pantheon Report

Generated at 2019-01-21 10:39:30 (UTC).

Data path: AWS Brazil 2 on `ens5` (*local*) →Colombia cellular on `ppp0` (*remote*).

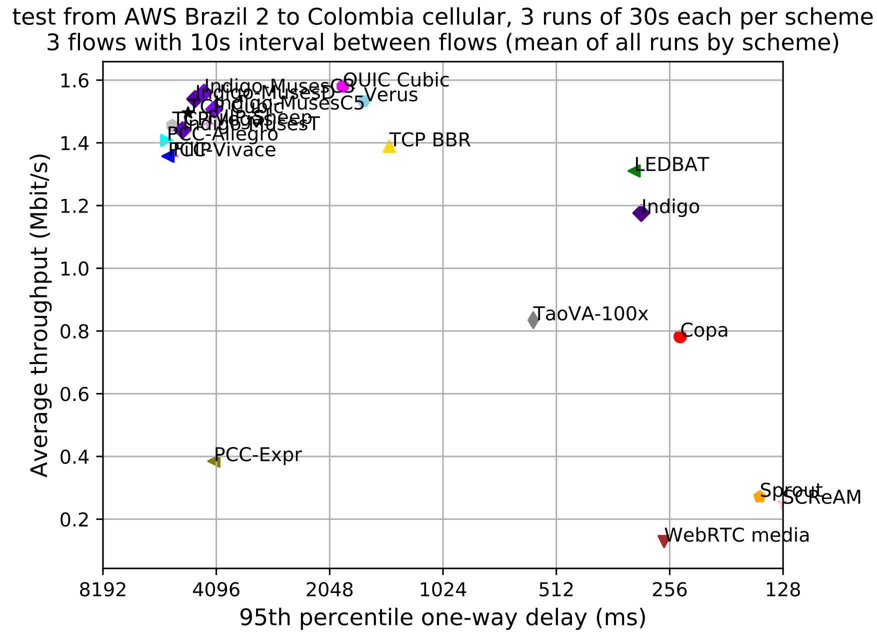
Repeated the test of 21 congestion control schemes 3 times.

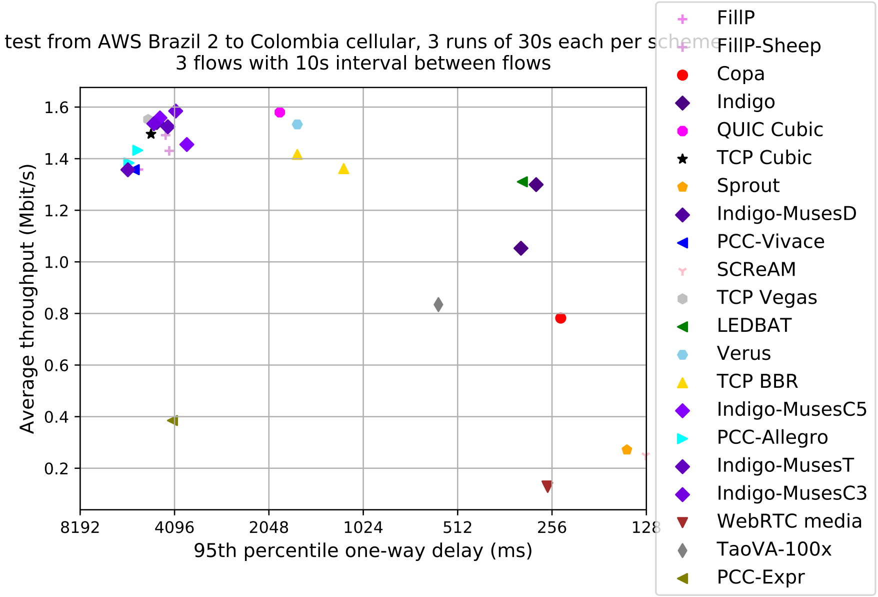
Each test lasted for 30 seconds running 3 flows with 10-second interval between two flows.

NTP offsets were measured against `gps.ntp.br` and have been applied to correct the timestamps in logs.

```
System info:
Linux 4.15.0-1031-aws
net.core.default_qdisc = fq
net.core.rmem_default = 16777216
net.core.rmem_max = 536870912
net.core.wmem_default = 16777216
net.core.wmem_max = 536870912
net.ipv4.tcp_rmem = 4096 16777216 536870912
net.ipv4.tcp_wmem = 4096 16777216 536870912
```

```
Git summary:
branch: muses @ 89d24e57783e7fbfec537a619071de937b639e38
third_party/fillp @ d6da1459332fcee56963885d7eba17e6a32d4519
third_party/fillp-sheep @ 0e5bb722943babcd2b090d2c64fcd45e12e923f9
third_party/genericCC @ d0153f8e594aa89e93b032143cedbdfe58e562f4
third_party/indigo @ 2601c92e4aa9d58d38dc4dfe0ecdbf90c077e64d
third_party/libutp @ b3465b942e2826f2b179eaab4a906ce6bb7cf3cf
third_party/muses @ 1ddcff131048c6962f123bcd22b4d166a422adde
third_party/pantheon-tunnel @ f866d3f58d27afd942717625ee3a354cc2e802bd
third_party/pcc @ 1afc958fa0d66d18b623c091a55fec872b4981e1
 M receiver/src/buffer.h
 M receiver/src/core.cpp
 M sender/src/buffer.h
 M sender/src/core.cpp
third_party/pcc-experimental @ cd43e34e3f5f5613e8acd08fab92c4eb24f974ab
third_party/proto-quic @ 77961f1a82733a86b42f1bc8143ebc978f3cff42
third_party/scream-reproduce @ f099118d1421aa3131bf11ff1964974e1da3bdb2
 M src/ScreamClient
 M src/ScreamServer
third_party/sprout @ 366e35c6178b01e31d4a46ad18c74f9415f19a26
 M src/examples/cellsim.cc
 M src/examples/sproutbt2.cc
 M src/network/sproutconn.cc
third_party/verus @ d4b447ea74c6c60a261149af2629562939f9a494
 M src/verus.hpp
 M tools/plot.py
third_party/vivace @ 2baf86211435ae071a32f96b7d8c504587f5d7f4
third_party/webrtc @ 3f0cc2a9061a41b6f9dde4735770d143a1fa2851
```


test from AWS Brazil 2 to Colombia cellular, 3 runs of 30s each per scheme
3 flows with 10s interval between flows (mean of all runs by scheme)
Average throughput (Mbit/s)
95th percentile one-way delay (ms)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
8192
4096
2048
1024
512
256
128
Indigo-MusesC3
Indigo-MusesD
Indigo-MusesC5
TCP Cubic
FillP-Sheep
TCP Vegas
Indigo-MusesT
PCC-Allegro
FillP
PCC-Vivace
QUIC Cubic
Verus
TCP BBR
LEDBAT
Indigo
TaoVA-100x
Copa
PCC-Expr
Sprout
SCReAM
WebRTC media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3 flows with 10s interval between flows
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95th percentile one-way delay (ms)
1.6
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FillP
FillP-Sheep
Copa
Indigo
QUIC Cubic
TCP Cubic
Sprout
Indigo-MusesD
PCC-Vivace
SCReAM
TCP Vegas
LEDBAT
Verus
TCP BBR
Indigo-MusesC5
PCC-Allegro
Indigo-MusesT
Indigo-MusesC3
WebRTC media
TaoVA-100x
PCC-Expr

scheme	# runs	mean avg tput (Mbit/s) flow 1	flow 2	flow 3	mean 95th-%ile delay (ms) flow 1	flow 2	flow 3	mean loss rate (%) flow 1	flow 2	flow 3
TCP BBR	2	0.85	0.53	0.62	1170.30	1214.80	1671.71	3.70	6.01	15.46
Copa	1	0.01	0.85	0.74	239.47	244.16	229.06	95.92	0.37	1.13
TCP Cubic	1	1.44	0.09	0.00	4860.67	4912.20	4906.31	17.41	28.61	8.58
FillP	1	0.92	0.71	0.00	5304.41	5397.79	5293.72	23.64	46.58	99.72
FillP-Sheep	2	0.89	0.80	0.20	4237.09	4173.45	4584.38	13.56	17.30	94.03
Indigo	2	0.71	0.56	0.30	264.55	376.52	414.62	0.00	0.55	1.38
Indigo-MusesC3	2	0.95	0.69	0.57	4463.29	3158.70	4500.54	88.50	27.86	98.27
Indigo-MusesC5	2	0.96	0.69	0.25	3934.78	4180.26	4268.73	20.34	24.41	73.77
Indigo-MusesD	1	1.09	0.65	0.01	4653.89	4670.30	4565.50	79.25	26.76	98.95
Indigo-MusesT	2	0.90	0.76	0.14	5148.13	4818.13	5005.34	83.24	45.53	99.35
LEDBAT	1	0.82	0.57	0.33	299.72	329.62	401.02	0.00	0.21	0.00
PCC-Allegro	2	1.40	0.00	0.00	5545.44	5260.40	4998.40	72.03	0.00	48.59
PCC-Expr	1	0.01	0.01	1.17	317.30	909.39	4159.30	57.14	0.00	80.56
QUIC Cubic	1	1.23	0.45	0.18	1873.86	1925.18	1953.83	4.50	9.92	23.78
SCReAM	1	0.08	0.17	0.16	118.62	128.81	128.66	0.00	0.15	0.33
Sprout	1	0.13	0.15	0.13	148.24	137.91	148.22	0.02	1.45	0.06
TaoVA-100x	1	0.01	0.95	0.70	235.43	545.54	651.04	85.45	0.93	4.04
TCP Vegas	2	1.46	0.01	0.00	5361.68	5080.13	4986.61	25.12	41.86	61.45
Verus	1	1.52	0.01	0.01	1662.26	1613.29	1640.58	3.91	5.00	10.00
PCC-Vivace	1	0.87	0.78	0.00	5444.87	5545.12	5471.16	34.11	56.28	49.43
WebRTC media	2	0.04	0.04	0.04	264.67	270.98	238.93	0.00	0.00	0.00

Run 1: Statistics of TCP BBR

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of TCP BBR — Data Link

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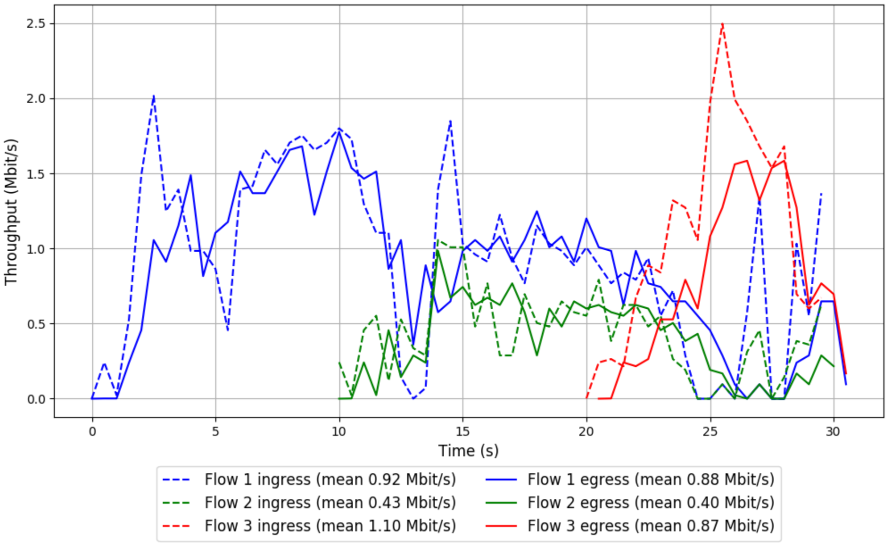
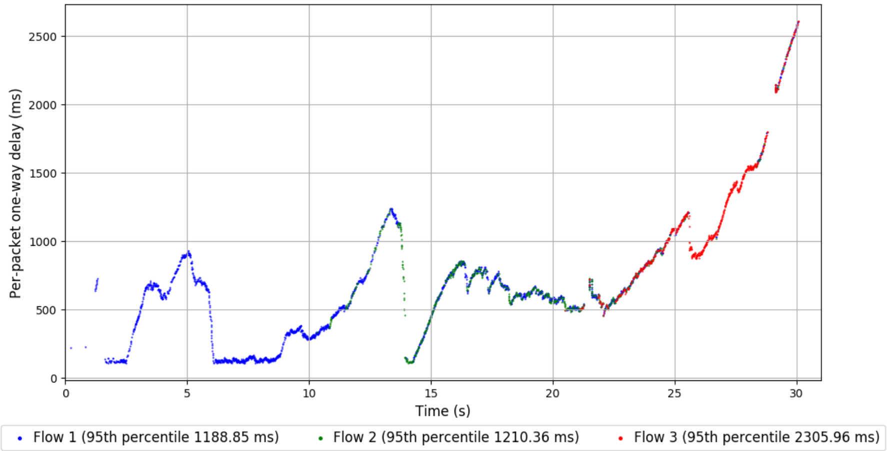
```
Run 2: Statistics of TCP BBR

Start at: 2019-01-21 10:11:20
End at: 2019-01-21 10:11:50
Local clock offset: -1.506 ms
Remote clock offset: 6.429 ms

# Below is generated by plot.py at 2019-01-21 10:39:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.42 Mbit/s
95th percentile per-packet one-way delay: 1662.519 ms
Loss rate: 10.36%
-- Flow 1:
Average throughput: 0.88 Mbit/s
95th percentile per-packet one-way delay: 1188.845 ms
Loss rate: 5.35%
-- Flow 2:
Average throughput: 0.40 Mbit/s
95th percentile per-packet one-way delay: 1210.357 ms
Loss rate: 8.80%
-- Flow 3:
Average throughput: 0.87 Mbit/s
95th percentile per-packet one-way delay: 2305.962 ms
Loss rate: 24.18%
```

Run 2: Report of TCP BBR — Data Link



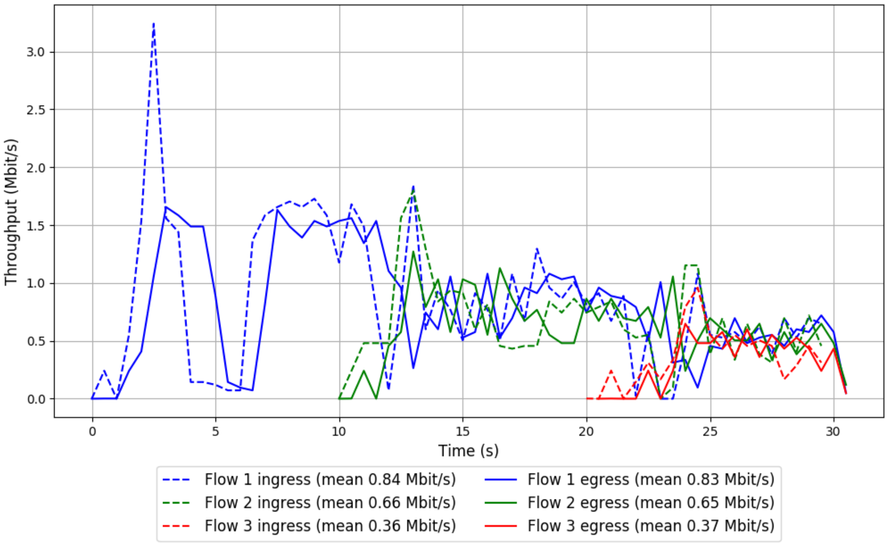


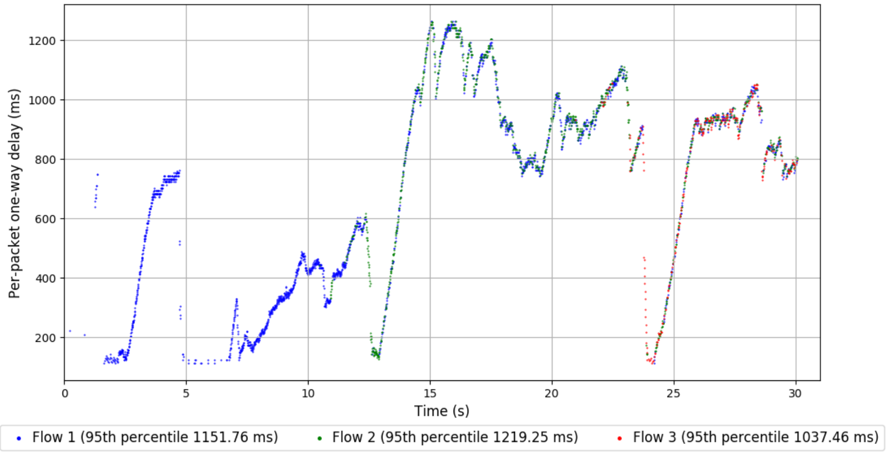
```
Run 3: Statistics of TCP BBR

Start at: 2019-01-21 10:37:08
End at: 2019-01-21 10:37:38
Local clock offset: -7.284 ms
Remote clock offset: 7.485 ms

# Below is generated by plot.py at 2019-01-21 10:39:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.36 Mbit/s
95th percentile per-packet one-way delay: 1182.274 ms
Loss rate: 2.81%
-- Flow 1:
Average throughput: 0.83 Mbit/s
95th percentile per-packet one-way delay: 1151.762 ms
Loss rate: 2.05%
-- Flow 2:
Average throughput: 0.65 Mbit/s
95th percentile per-packet one-way delay: 1219.252 ms
Loss rate: 3.21%
-- Flow 3:
Average throughput: 0.37 Mbit/s
95th percentile per-packet one-way delay: 1037.460 ms
Loss rate: 6.73%
```

Run 3: Report of TCP BBR — Data Link





Run 1: Statistics of Copa

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of Copa — Data Link

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Run 2: Statistics of Copa

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 2: Report of Copa — Data Link

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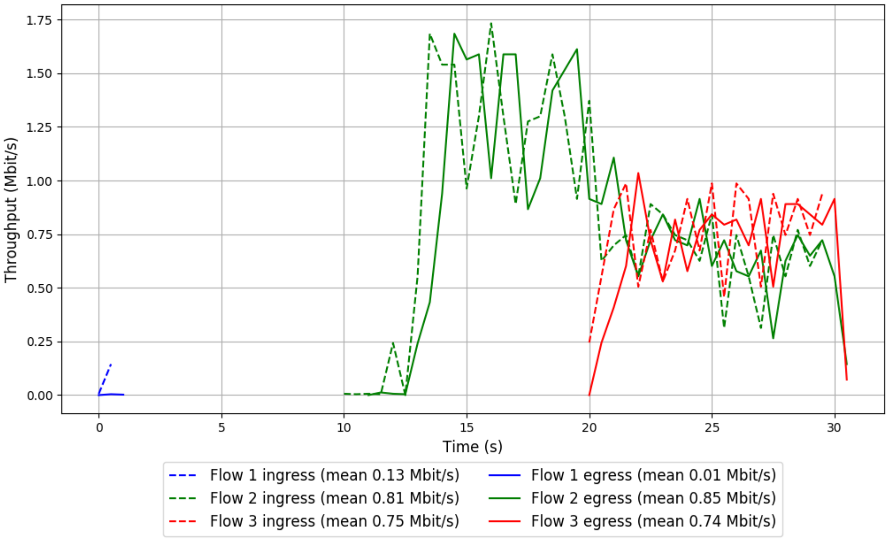
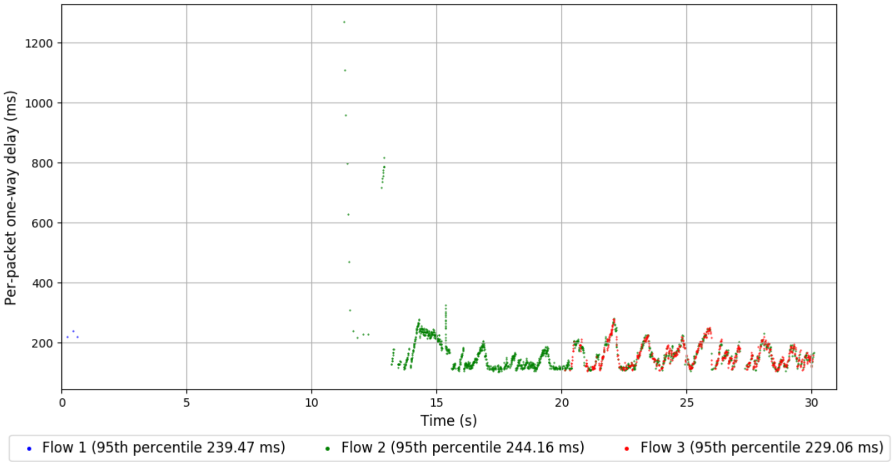
```
Run 3: Statistics of Copa

Start at: 2019-01-21 10:23:37
End at: 2019-01-21 10:24:07
Local clock offset: -4.722 ms
Remote clock offset: 7.26 ms

# Below is generated by plot.py at 2019-01-21 10:39:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.78 Mbit/s
95th percentile per-packet one-way delay: 240.118 ms
Loss rate: 0.92%
-- Flow 1:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 239.472 ms
Loss rate: 95.92%
-- Flow 2:
Average throughput: 0.85 Mbit/s
95th percentile per-packet one-way delay: 244.165 ms
Loss rate: 0.37%
-- Flow 3:
Average throughput: 0.74 Mbit/s
95th percentile per-packet one-way delay: 229.060 ms
Loss rate: 1.13%
```

Run 3: Report of Copa — Data Link





Run 1: Statistics of TCP Cubic

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of TCP Cubic — Data Link

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Run 2: Statistics of TCP Cubic

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 2: Report of TCP Cubic — Data Link

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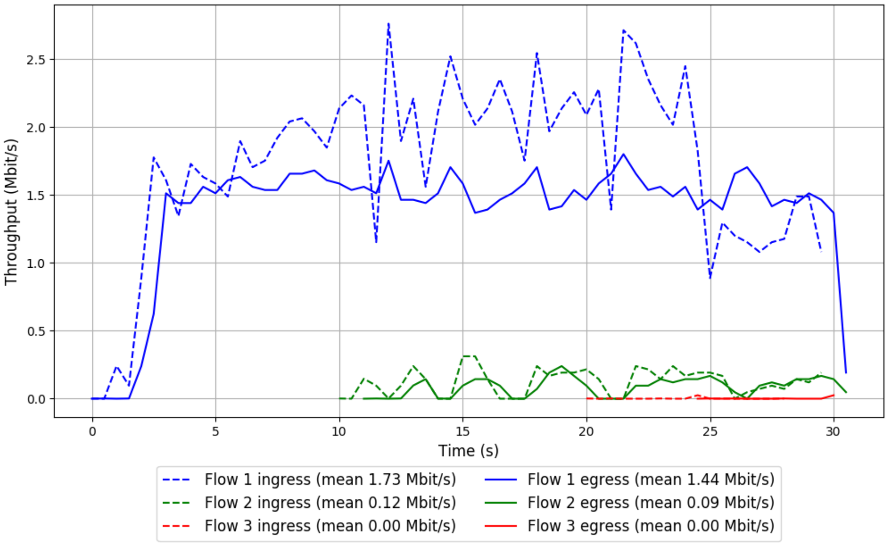
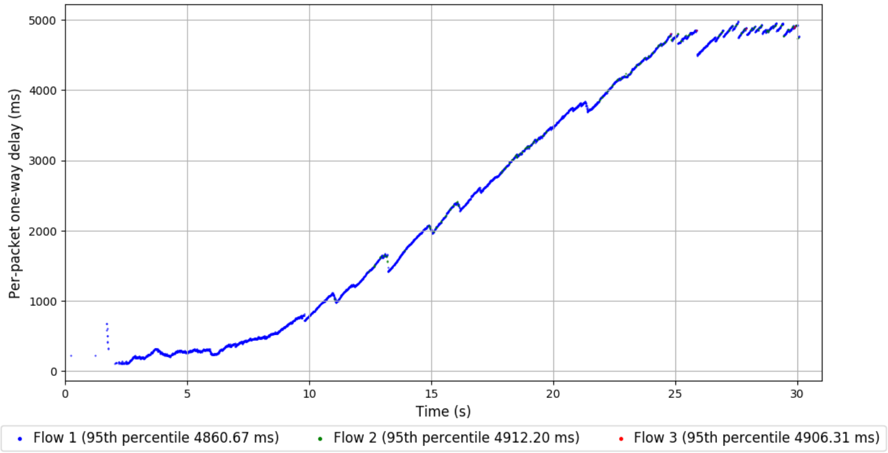
```
Run 3: Statistics of TCP Cubic

Start at: 2019-01-21 10:13:48
End at: 2019-01-21 10:14:18
Local clock offset: -2.272 ms
Remote clock offset: 3.073 ms

# Below is generated by plot.py at 2019-01-21 10:39:11
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.50 Mbit/s
95th percentile per-packet one-way delay: 4868.334 ms
Loss rate: 17.91%
-- Flow 1:
Average throughput: 1.44 Mbit/s
95th percentile per-packet one-way delay: 4860.668 ms
Loss rate: 17.41%
-- Flow 2:
Average throughput: 0.09 Mbit/s
95th percentile per-packet one-way delay: 4912.199 ms
Loss rate: 28.61%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 4906.311 ms
Loss rate: 8.58%
```

Run 3: Report of TCP Cubic — Data Link





```
Run 1: Statistics of FillP

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows
```

Run 1: Report of FillP — Data Link

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Run 2: Statistics of FillP

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 2: Report of FillP — Data Link

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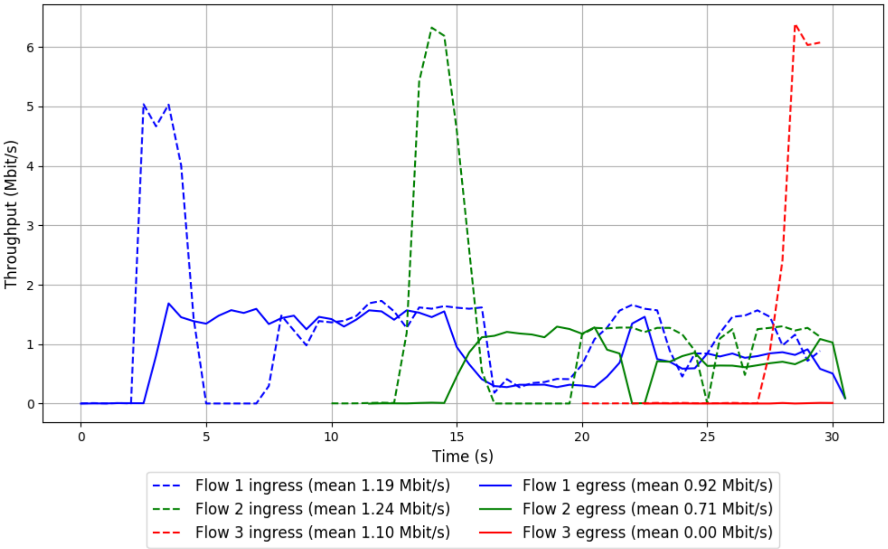
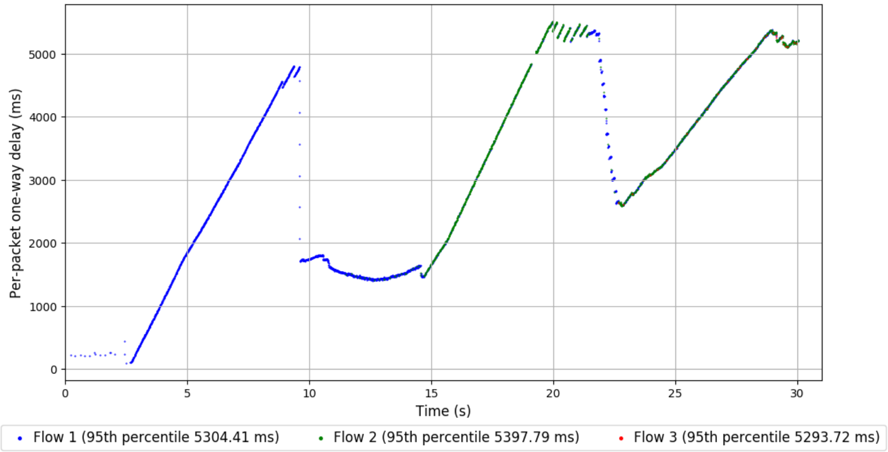
```
Run 3: Statistics of FillP

Start at: 2019-01-21 10:19:56
End at: 2019-01-21 10:20:26
Local clock offset: -3.375 ms
Remote clock offset: 7.03 ms

# Below is generated by plot.py at 2019-01-21 10:39:12
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.36 Mbit/s
95th percentile per-packet one-way delay: 5337.642 ms
Loss rate: 43.24%
-- Flow 1:
Average throughput: 0.92 Mbit/s
95th percentile per-packet one-way delay: 5304.414 ms
Loss rate: 23.64%
-- Flow 2:
Average throughput: 0.71 Mbit/s
95th percentile per-packet one-way delay: 5397.789 ms
Loss rate: 46.58%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 5293.724 ms
Loss rate: 99.72%
```

Run 3: Report of FillP — Data Link





Run 1: Statistics of FillP-Sheep

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of FillP-Sheep — Data Link

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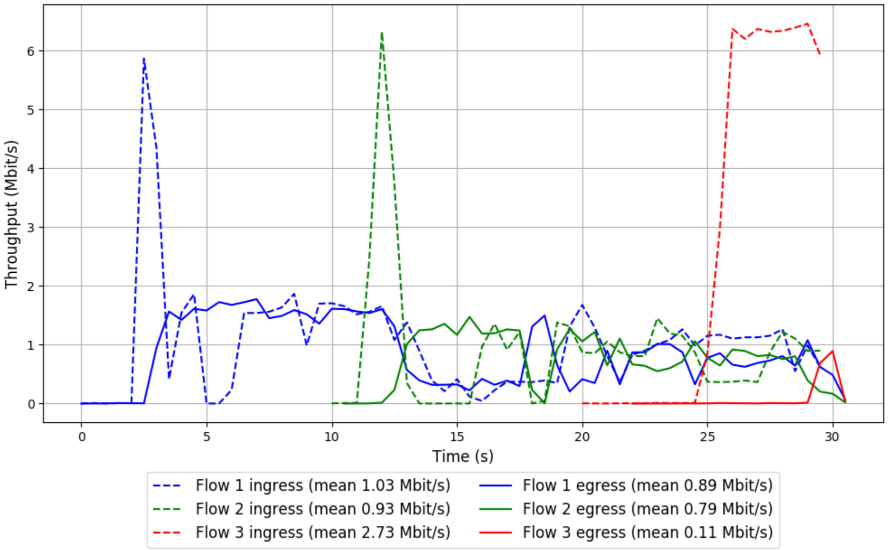
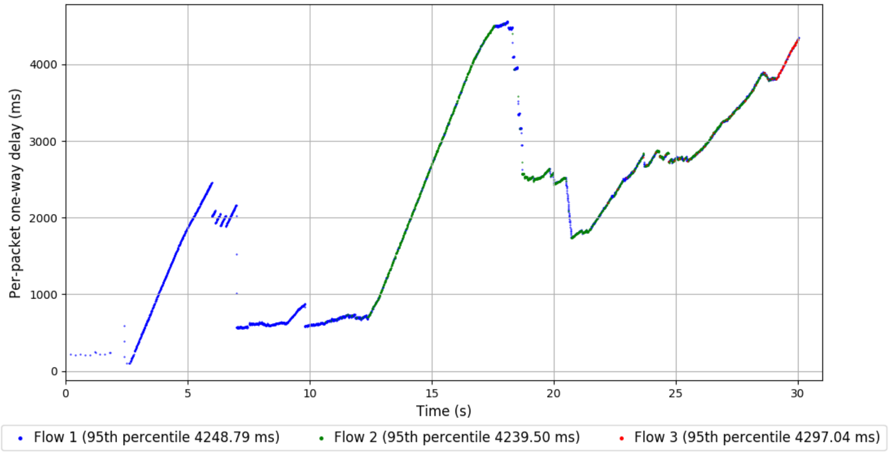
```
Run 2: Statistics of FillP-Sheep

Start at: 2019-01-21 10:01:25
End at: 2019-01-21 10:01:55
Local clock offset: -2.422 ms
Remote clock offset: 2.276 ms

# Below is generated by plot.py at 2019-01-21 10:39:12
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.43 Mbit/s
95th percentile per-packet one-way delay: 4258.880 ms
Loss rate: 44.21%
-- Flow 1:
Average throughput: 0.89 Mbit/s
95th percentile per-packet one-way delay: 4248.791 ms
Loss rate: 14.04%
-- Flow 2:
Average throughput: 0.79 Mbit/s
95th percentile per-packet one-way delay: 4239.498 ms
Loss rate: 17.16%
-- Flow 3:
Average throughput: 0.11 Mbit/s
95th percentile per-packet one-way delay: 4297.038 ms
Loss rate: 96.86%
```

Run 2: Report of FillP-Sheep — Data Link



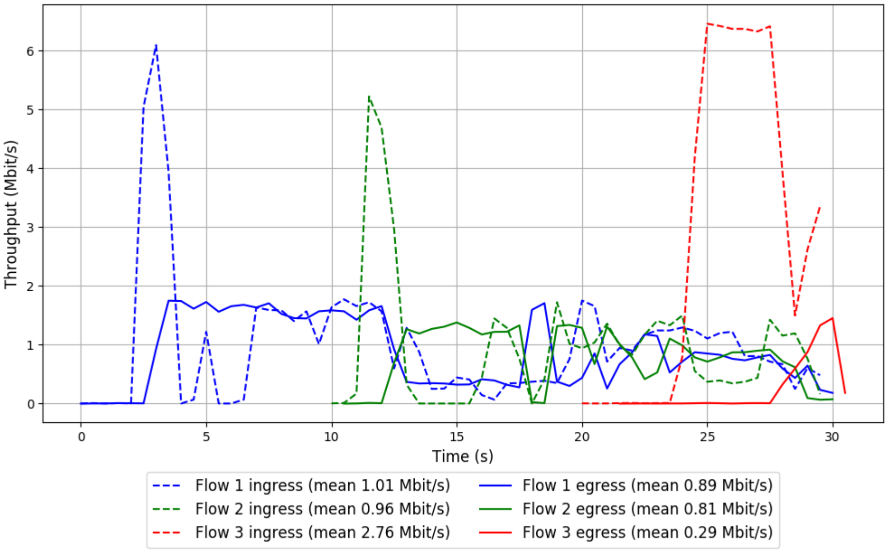


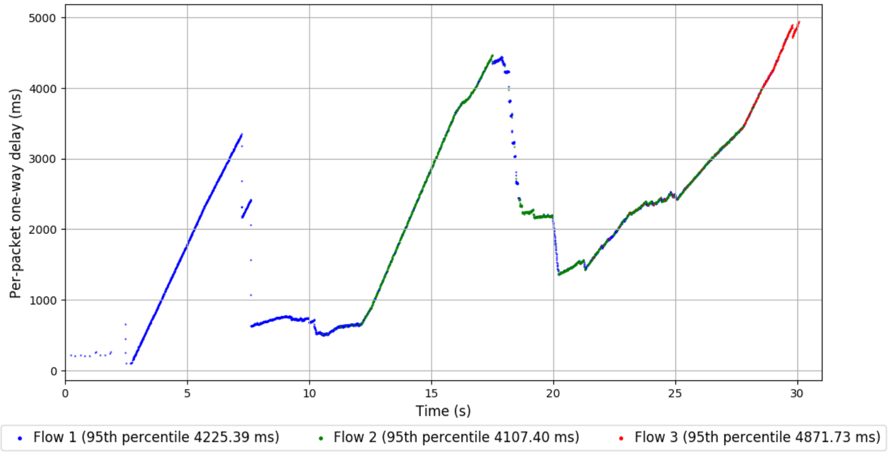
```
Run 3: Statistics of FillP-Sheep

Start at: 2019-01-21 10:27:18
End at: 2019-01-21 10:27:48
Local clock offset: -6.621 ms
Remote clock offset: 7.328 ms

# Below is generated by plot.py at 2019-01-21 10:39:13
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.49 Mbit/s
95th percentile per-packet one-way delay: 4373.347 ms
Loss rate: 42.04%
-- Flow 1:
Average throughput: 0.89 Mbit/s
95th percentile per-packet one-way delay: 4225.387 ms
Loss rate: 13.09%
-- Flow 2:
Average throughput: 0.81 Mbit/s
95th percentile per-packet one-way delay: 4107.398 ms
Loss rate: 17.43%
-- Flow 3:
Average throughput: 0.29 Mbit/s
95th percentile per-packet one-way delay: 4871.726 ms
Loss rate: 91.20%
```

Run 3: Report of FillP-Sheep — Data Link





Run 1: Statistics of Indigo

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of Indigo — Data Link

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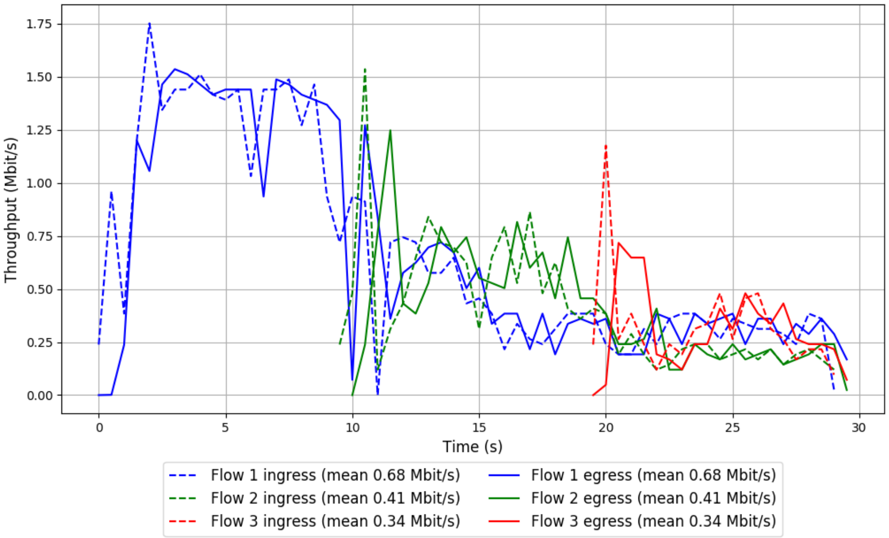
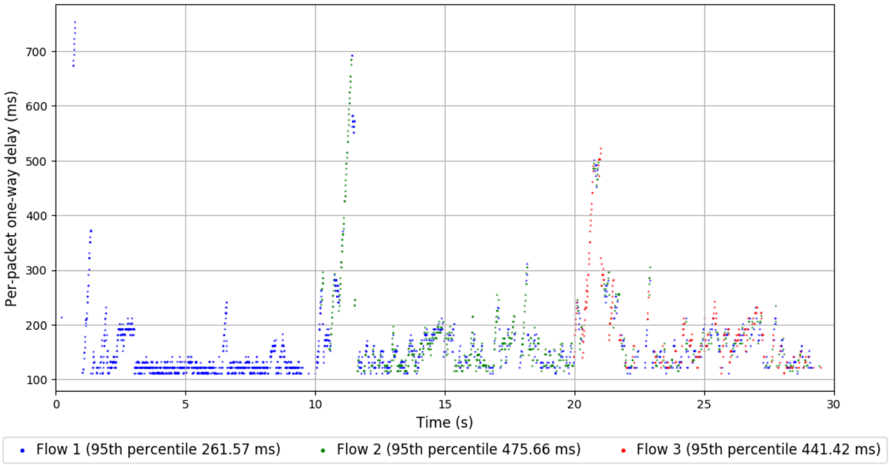
```
Run 2: Statistics of Indigo

Start at: 2019-01-21 10:12:34
End at: 2019-01-21 10:13:04
Local clock offset: -2.278 ms
Remote clock offset: 6.79 ms

# Below is generated by plot.py at 2019-01-21 10:39:13
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.05 Mbit/s
95th percentile per-packet one-way delay: 321.560 ms
Loss rate: 0.23%
-- Flow 1:
Average throughput: 0.68 Mbit/s
95th percentile per-packet one-way delay: 261.567 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.41 Mbit/s
95th percentile per-packet one-way delay: 475.660 ms
Loss rate: 0.60%
-- Flow 3:
Average throughput: 0.34 Mbit/s
95th percentile per-packet one-way delay: 441.416 ms
Loss rate: 0.74%
```

Run 2: Report of Indigo — Data Link



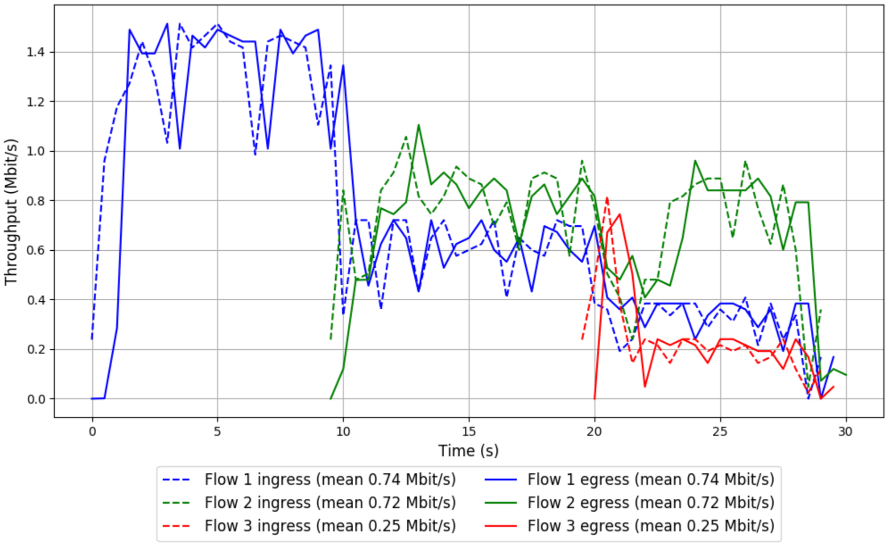


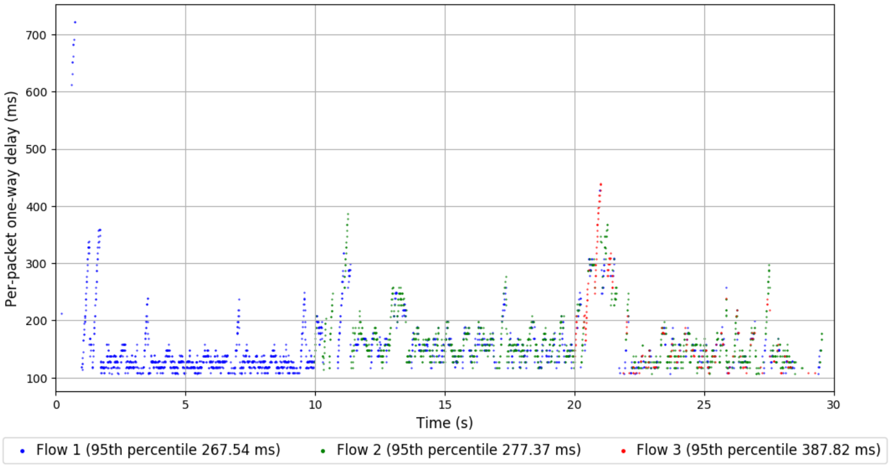
```
Run 3: Statistics of Indigo

Start at: 2019-01-21 10:38:26
End at: 2019-01-21 10:38:56
Local clock offset: -8.191 ms
Remote clock offset: 3.37 ms

# Below is generated by plot.py at 2019-01-21 10:39:13
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.30 Mbit/s
95th percentile per-packet one-way delay: 287.617 ms
Loss rate: 0.31%
-- Flow 1:
Average throughput: 0.74 Mbit/s
95th percentile per-packet one-way delay: 267.536 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.72 Mbit/s
95th percentile per-packet one-way delay: 277.374 ms
Loss rate: 0.51%
-- Flow 3:
Average throughput: 0.25 Mbit/s
95th percentile per-packet one-way delay: 387.817 ms
Loss rate: 2.01%
```

Run 3: Report of Indigo — Data Link





Run 1: Statistics of Indigo-MusesC3

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of Indigo-MusesC3 — Data Link

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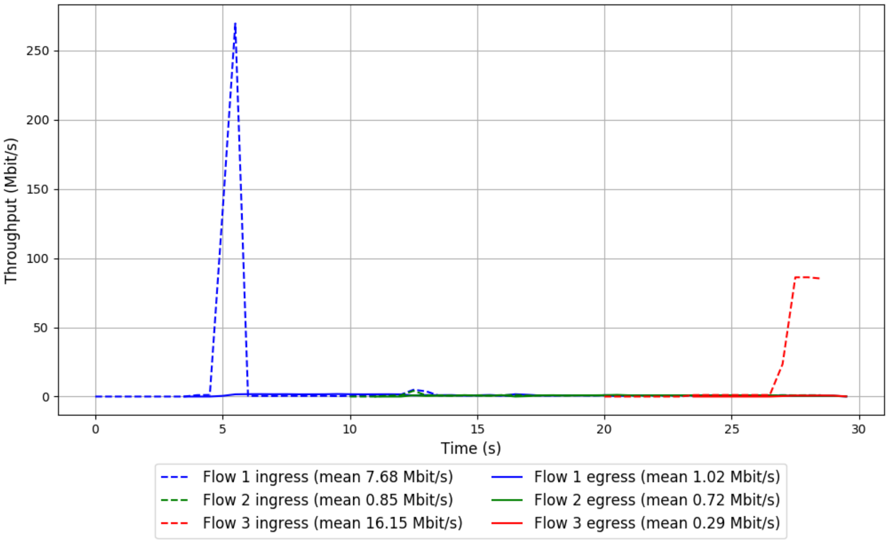
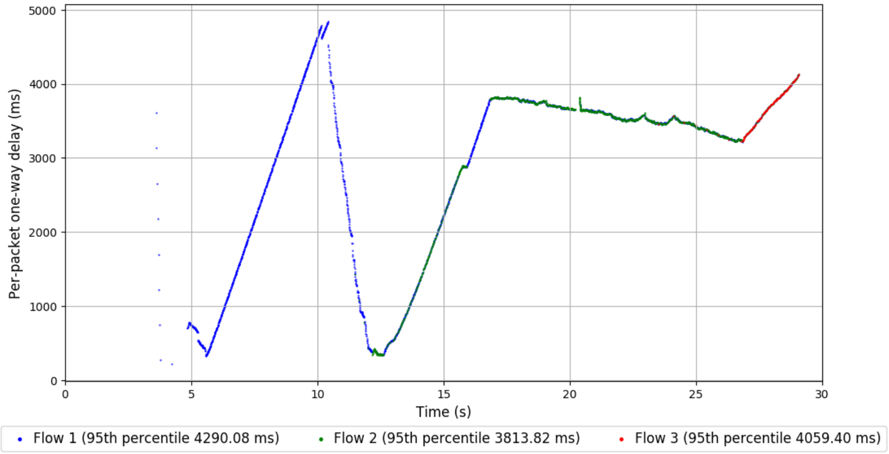
```
Run 2: Statistics of Indigo-MusesC3

Start at: 2019-01-21 10:06:19
End at: 2019-01-21 10:06:49
Local clock offset: -1.823 ms
Remote clock offset: 2.415 ms

# Below is generated by plot.py at 2019-01-21 10:39:21
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.58 Mbit/s
95th percentile per-packet one-way delay: 4061.575 ms
Loss rate: 89.48%
-- Flow 1:
Average throughput: 1.02 Mbit/s
95th percentile per-packet one-way delay: 4290.084 ms
Loss rate: 88.30%
-- Flow 2:
Average throughput: 0.72 Mbit/s
95th percentile per-packet one-way delay: 3813.823 ms
Loss rate: 21.75%
-- Flow 3:
Average throughput: 0.29 Mbit/s
95th percentile per-packet one-way delay: 4059.396 ms
Loss rate: 98.87%
```

Run 2: Report of Indigo-MusesC3 — Data Link



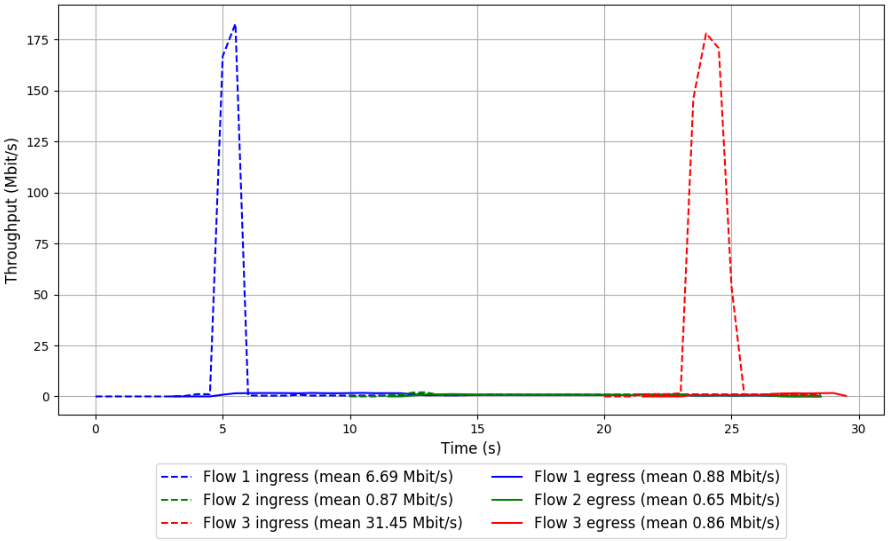


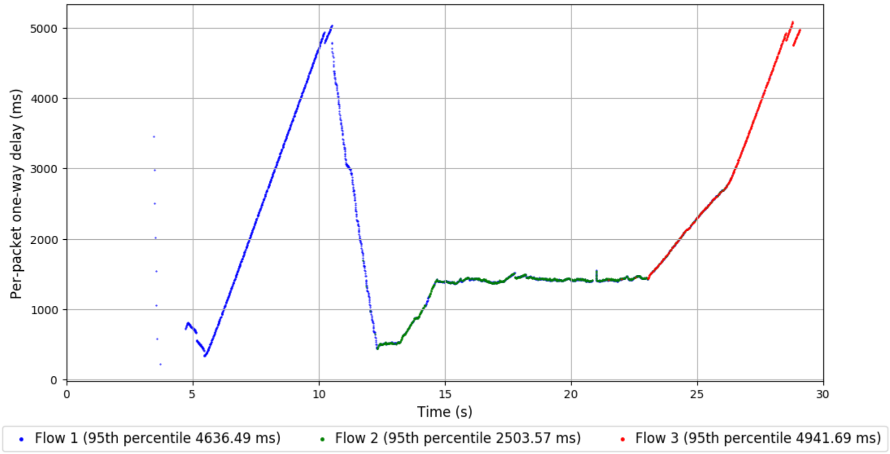
```
Run 3: Statistics of Indigo-MusesC3

Start at: 2019-01-21 10:32:13
End at: 2019-01-21 10:32:43
Local clock offset: -6.663 ms
Remote clock offset: 3.18 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.54 Mbit/s
95th percentile per-packet one-way delay: 4766.323 ms
Loss rate: 91.97%
-- Flow 1:
Average throughput: 0.88 Mbit/s
95th percentile per-packet one-way delay: 4636.488 ms
Loss rate: 88.69%
-- Flow 2:
Average throughput: 0.65 Mbit/s
95th percentile per-packet one-way delay: 2503.575 ms
Loss rate: 33.97%
-- Flow 3:
Average throughput: 0.86 Mbit/s
95th percentile per-packet one-way delay: 4941.692 ms
Loss rate: 97.66%
```

Run 3: Report of Indigo-MusesC3 — Data Link





Run 1: Statistics of Indigo-MusesC5

```
/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows
```

Run 1: Report of Indigo-MusesC5 — Data Link

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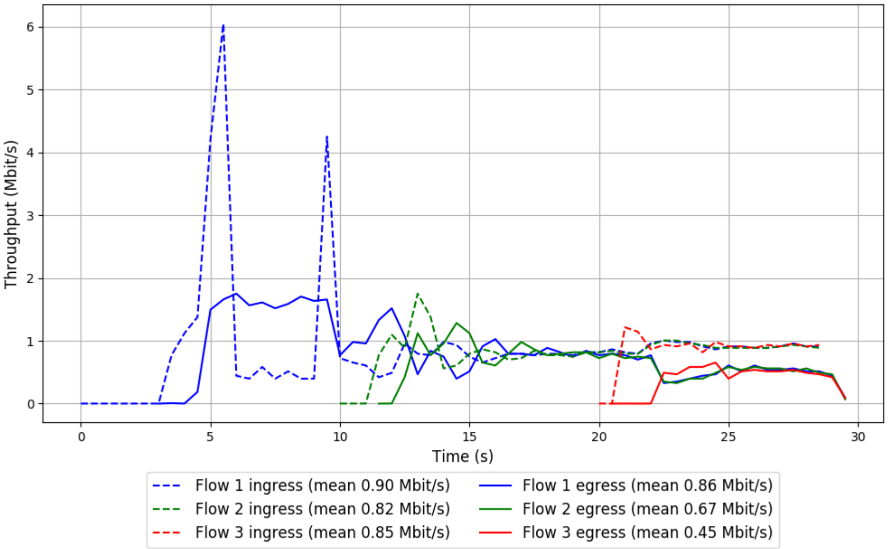
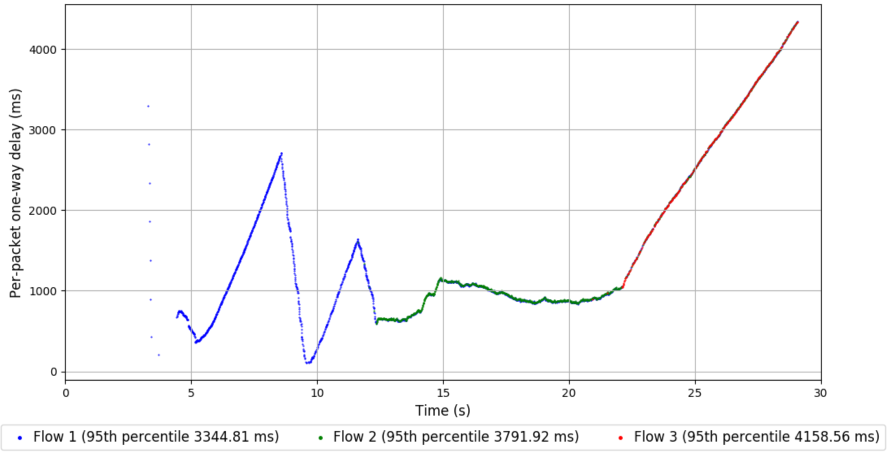
```
Run 2: Statistics of Indigo-MusesC5

Start at: 2019-01-21 10:02:38
End at: 2019-01-21 10:03:08
Local clock offset: -3.033 ms
Remote clock offset: 2.614 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.45 Mbit/s
95th percentile per-packet one-way delay: 3741.922 ms
Loss rate: 23.87%
-- Flow 1:
Average throughput: 0.86 Mbit/s
95th percentile per-packet one-way delay: 3344.813 ms
Loss rate: 15.13%
-- Flow 2:
Average throughput: 0.67 Mbit/s
95th percentile per-packet one-way delay: 3791.924 ms
Loss rate: 24.73%
-- Flow 3:
Average throughput: 0.45 Mbit/s
95th percentile per-packet one-way delay: 4158.564 ms
Loss rate: 52.14%
```

Run 2: Report of Indigo-MusesC5 — Data Link



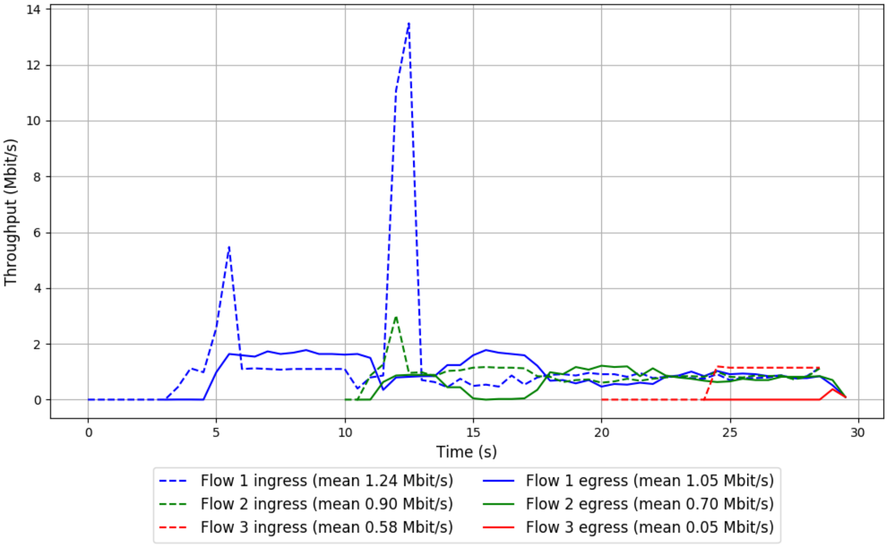


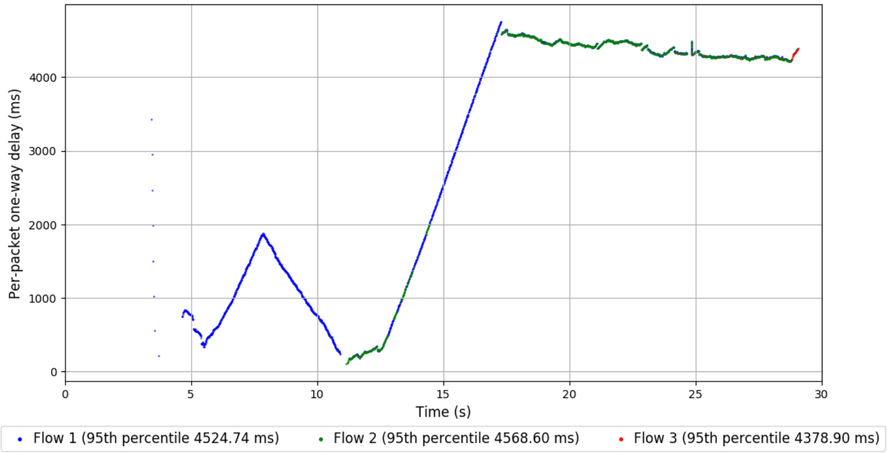
```
Run 3: Statistics of Indigo-MusesC5

Start at: 2019-01-21 10:28:32
End at: 2019-01-21 10:29:02
Local clock offset: -6.872 ms
Remote clock offset: 3.188 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.56 Mbit/s
95th percentile per-packet one-way delay: 4558.847 ms
Loss rate: 31.34%
-- Flow 1:
Average throughput: 1.05 Mbit/s
95th percentile per-packet one-way delay: 4524.737 ms
Loss rate: 25.54%
-- Flow 2:
Average throughput: 0.70 Mbit/s
95th percentile per-packet one-way delay: 4568.602 ms
Loss rate: 24.10%
-- Flow 3:
Average throughput: 0.05 Mbit/s
95th percentile per-packet one-way delay: 4378.905 ms
Loss rate: 95.39%
```

Run 3: Report of Indigo-MusesC5 — Data Link





Run 1: Statistics of Indigo-MusesD

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of Indigo-MusesD — Data Link

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Run 2: Statistics of Indigo-MusesD

```
/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows
```

Run 2: Report of Indigo-MusesD — Data Link

Figure is missing

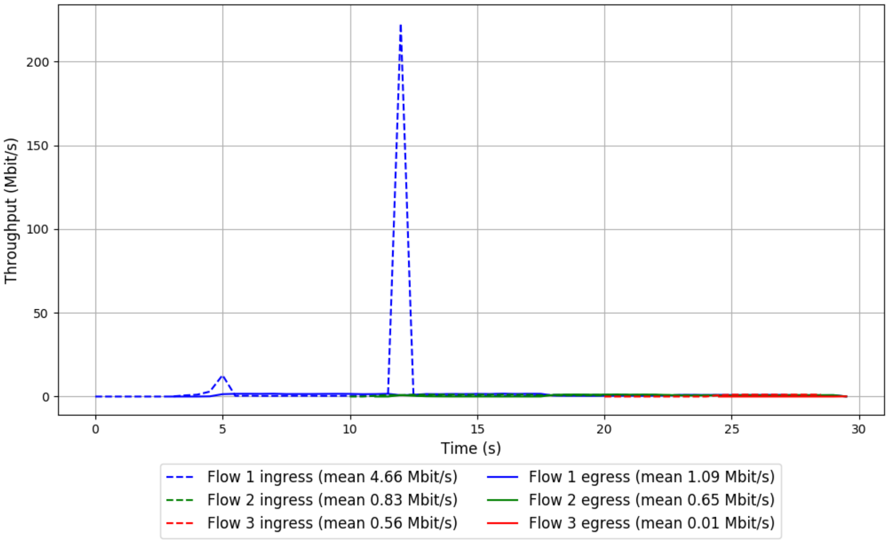
Figure is missing

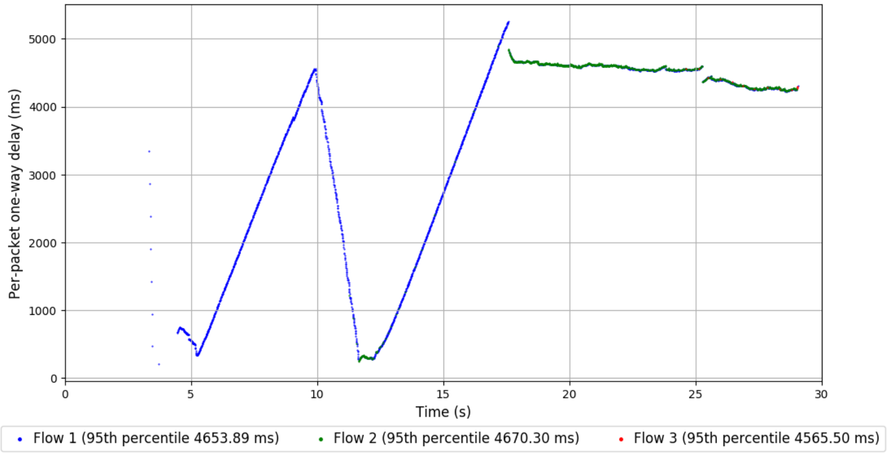
```
Run 3: Statistics of Indigo-MusesD

Start at: 2019-01-21 10:17:28
End at: 2019-01-21 10:17:58
Local clock offset: -1.865 ms
Remote clock offset: 3.369 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.54 Mbit/s
95th percentile per-packet one-way delay: 4663.664 ms
Loss rate: 74.59%
-- Flow 1:
Average throughput: 1.09 Mbit/s
95th percentile per-packet one-way delay: 4653.887 ms
Loss rate: 79.25%
-- Flow 2:
Average throughput: 0.65 Mbit/s
95th percentile per-packet one-way delay: 4670.300 ms
Loss rate: 26.76%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 4565.497 ms
Loss rate: 98.95%
```

Run 3: Report of Indigo-MusesD — Data Link





Run 1: Statistics of Indigo-MusesT

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of Indigo-MusesT — Data Link

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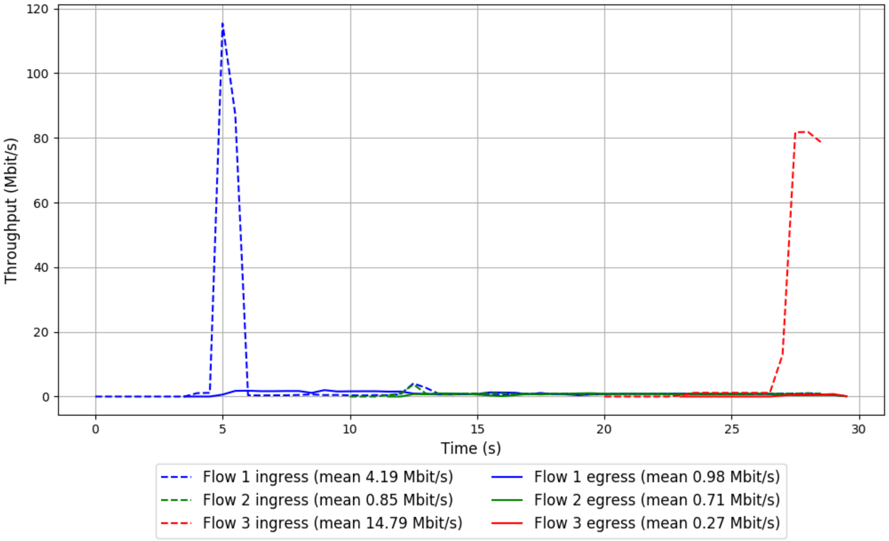
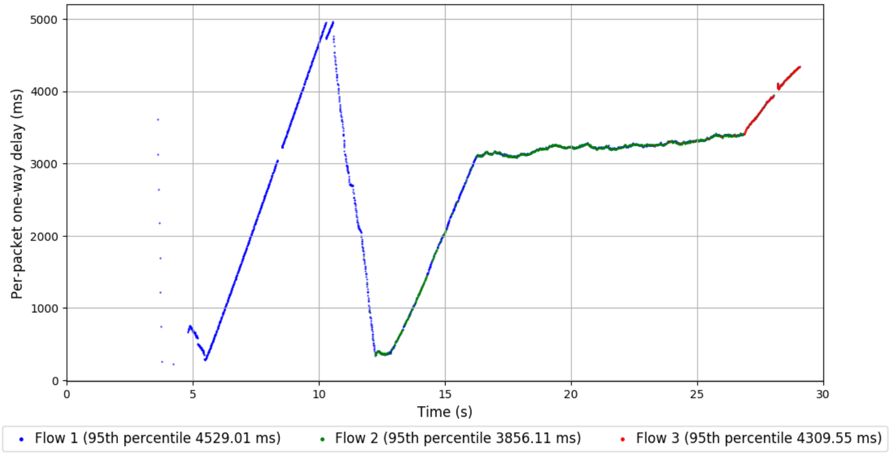
```
Run 2: Statistics of Indigo-MusesT

Start at: 2019-01-21 10:03:52
End at: 2019-01-21 10:04:22
Local clock offset: -2.127 ms
Remote clock offset: 2.33 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.52 Mbit/s
95th percentile per-packet one-way delay: 4301.946 ms
Loss rate: 85.60%
-- Flow 1:
Average throughput: 0.98 Mbit/s
95th percentile per-packet one-way delay: 4529.012 ms
Loss rate: 79.51%
-- Flow 2:
Average throughput: 0.71 Mbit/s
95th percentile per-packet one-way delay: 3856.105 ms
Loss rate: 23.38%
-- Flow 3:
Average throughput: 0.27 Mbit/s
95th percentile per-packet one-way delay: 4309.552 ms
Loss rate: 98.82%
```

Run 2: Report of Indigo-MusesT — Data Link



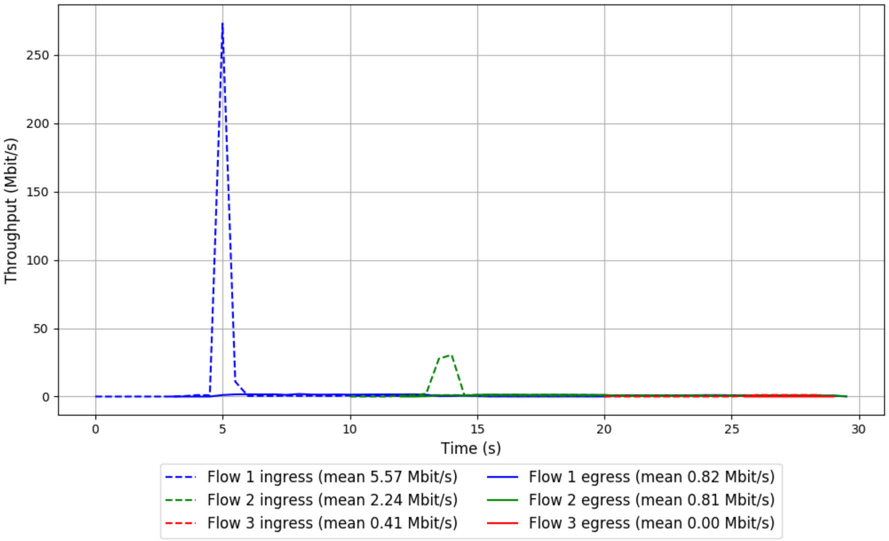


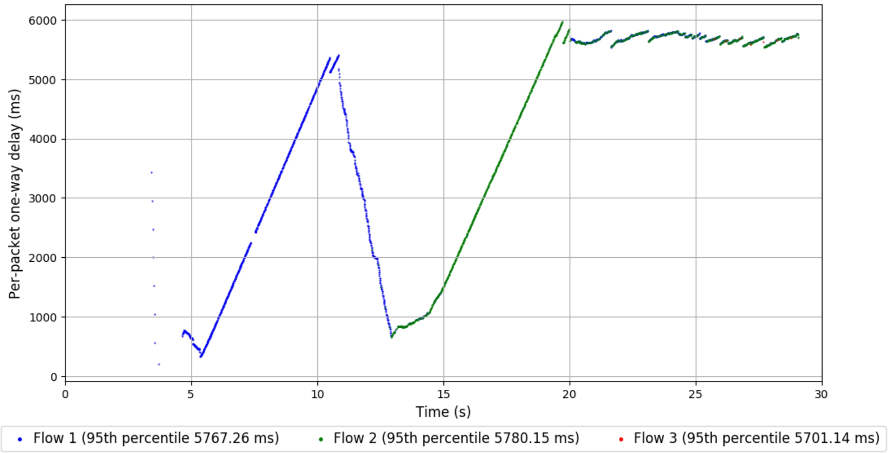
```
Run 3: Statistics of Indigo-MusesT

Start at: 2019-01-21 10:29:45
End at: 2019-01-21 10:30:15
Local clock offset: -6.195 ms
Remote clock offset: 7.02 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.36 Mbit/s
95th percentile per-packet one-way delay: 5770.242 ms
Loss rate: 83.25%
-- Flow 1:
Average throughput: 0.82 Mbit/s
95th percentile per-packet one-way delay: 5767.257 ms
Loss rate: 86.97%
-- Flow 2:
Average throughput: 0.81 Mbit/s
95th percentile per-packet one-way delay: 5780.146 ms
Loss rate: 67.68%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 5701.138 ms
Loss rate: 99.89%
```

Run 3: Report of Indigo-MusesT — Data Link





Run 1: Statistics of LEDBAT

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of LEDBAT — Data Link

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Run 2: Statistics of LEDBAT

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 2: Report of LEDBAT — Data Link

Figure is missing

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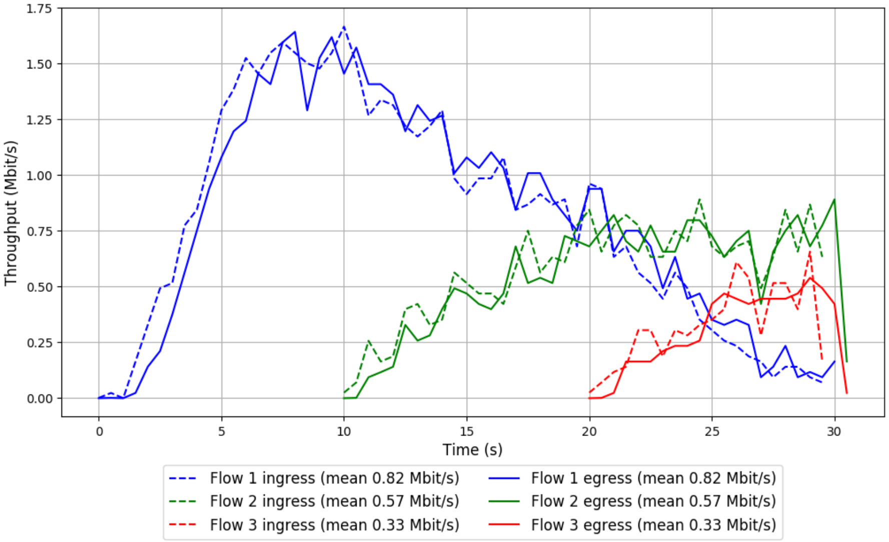
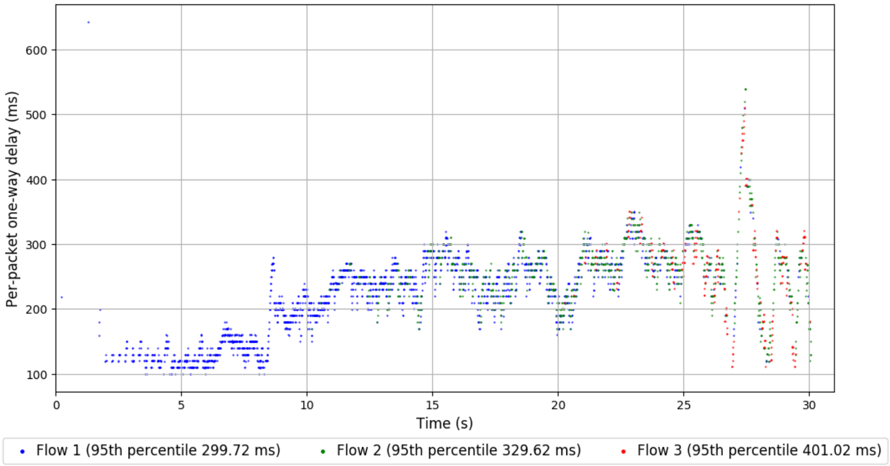
```
Run 3: Statistics of LEDBAT

Start at: 2019-01-21 10:26:04
End at: 2019-01-21 10:26:34
Local clock offset: -6.272 ms
Remote clock offset: 3.522 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.31 Mbit/s
95th percentile per-packet one-way delay: 318.277 ms
Loss rate: 0.06%
-- Flow 1:
Average throughput: 0.82 Mbit/s
95th percentile per-packet one-way delay: 299.717 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.57 Mbit/s
95th percentile per-packet one-way delay: 329.619 ms
Loss rate: 0.21%
-- Flow 3:
Average throughput: 0.33 Mbit/s
95th percentile per-packet one-way delay: 401.024 ms
Loss rate: 0.00%
```

Run 3: Report of LEDBAT — Data Link





Run 1: Statistics of PCC-Allegro

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of PCC-Allegro — Data Link

Figure is missing

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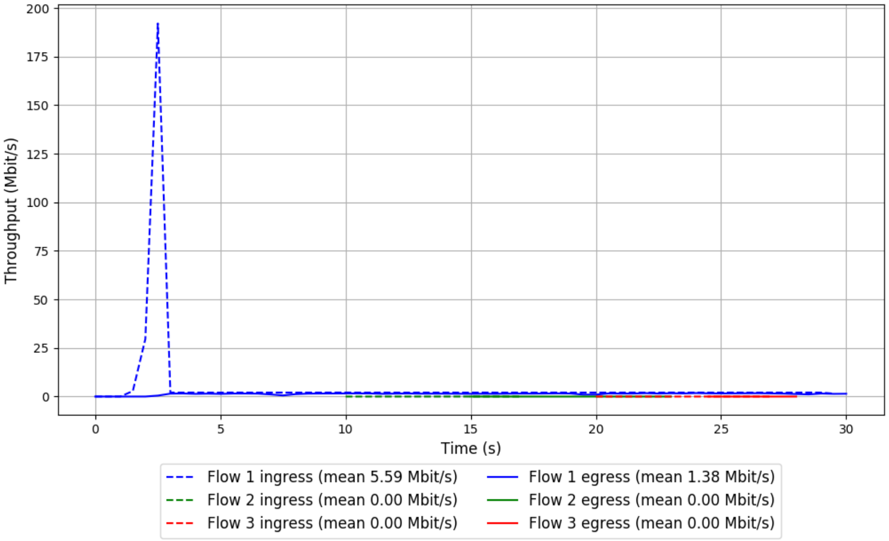
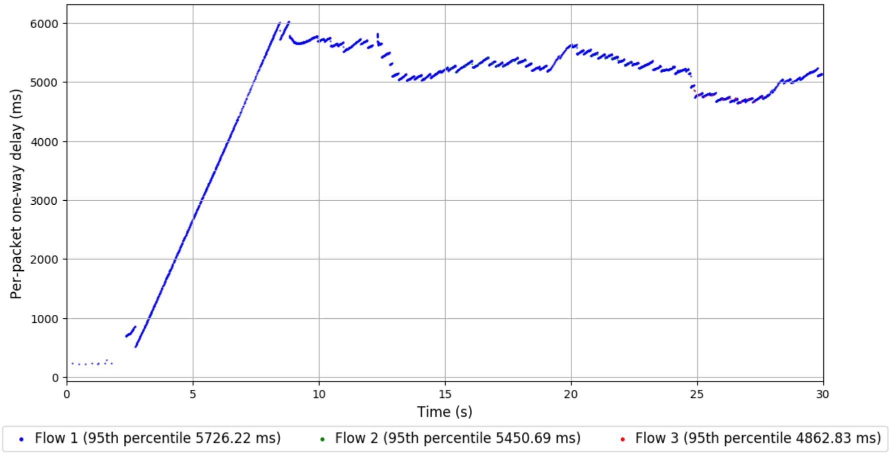
```
Run 2: Statistics of PCC-Allegro

Start at: 2019-01-21 10:10:06
End at: 2019-01-21 10:10:36
Local clock offset: -2.417 ms
Remote clock offset: 2.646 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.38 Mbit/s
95th percentile per-packet one-way delay: 5725.589 ms
Loss rate: 75.37%
-- Flow 1:
Average throughput: 1.38 Mbit/s
95th percentile per-packet one-way delay: 5726.218 ms
Loss rate: 75.39%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 5450.686 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 4862.828 ms
Loss rate: 49.43%
```

Run 2: Report of PCC-Allegro — Data Link



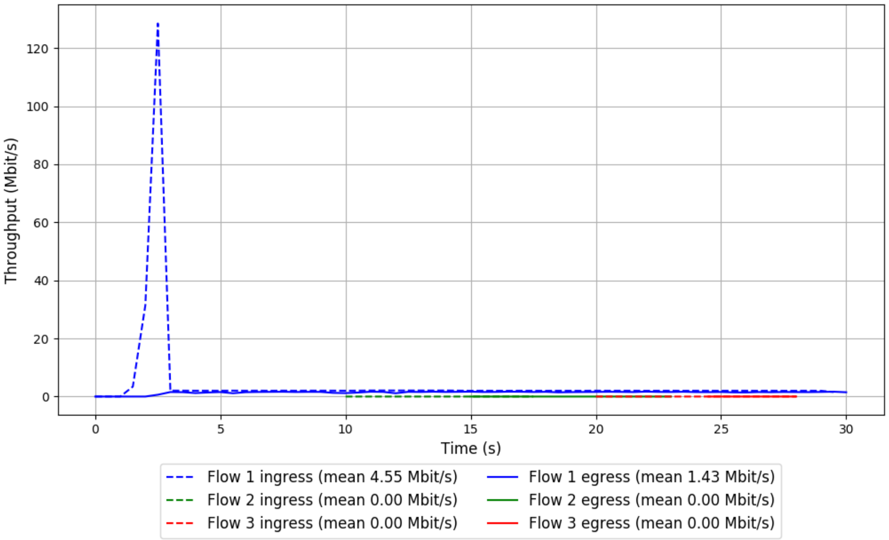


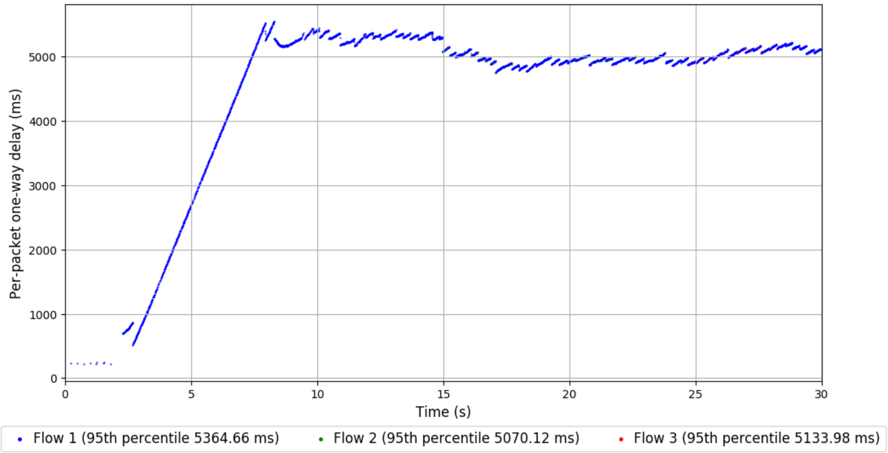
```
Run 3: Statistics of PCC-Allegro

Start at: 2019-01-21 10:35:54
End at: 2019-01-21 10:36:24
Local clock offset: -7.108 ms
Remote clock offset: 6.799 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.43 Mbit/s
95th percentile per-packet one-way delay: 5364.436 ms
Loss rate: 68.66%
-- Flow 1:
Average throughput: 1.43 Mbit/s
95th percentile per-packet one-way delay: 5364.665 ms
Loss rate: 68.67%
-- Flow 2:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 5070.123 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 5133.979 ms
Loss rate: 47.76%
```

Run 3: Report of PCC-Allegro — Data Link





Run 1: Statistics of PCC-Expr

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of PCC-Expr — Data Link

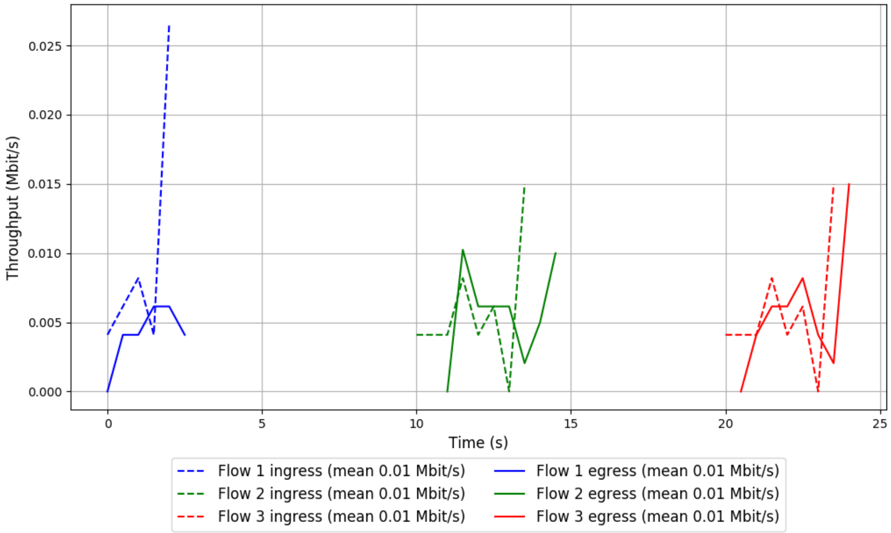
Figure is missing

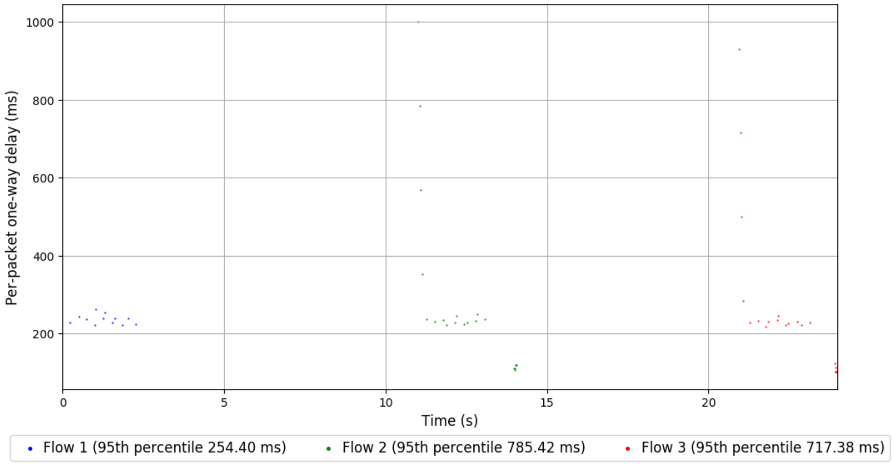
Figure is missing

```
Run 2: Statistics of PCC-Expr

Start at: 2019-01-21 10:05:06
End at: 2019-01-21 10:05:36
Local clock offset: -1.95 ms
Remote clock offset: 2.369 ms
```

Run 2: Report of PCC-Expr — Data Link



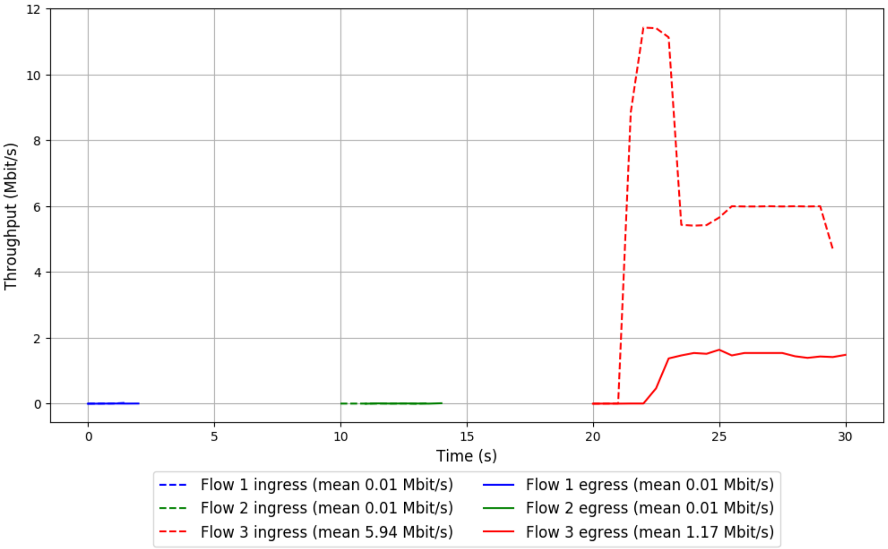


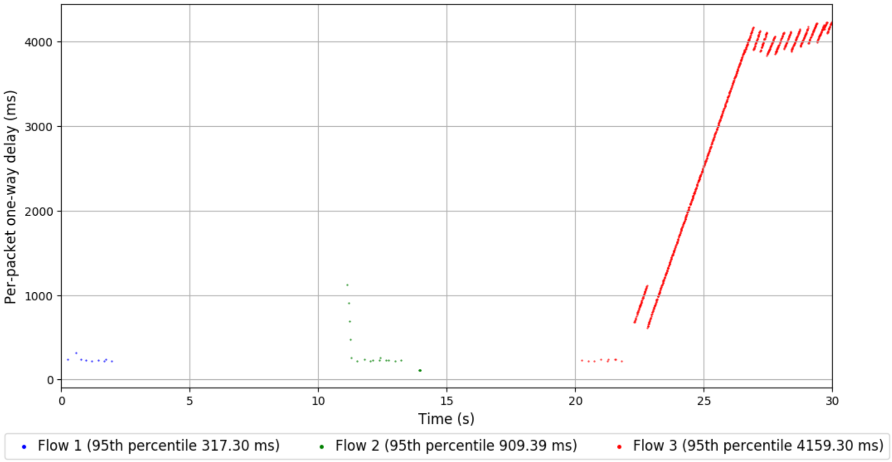
```
Run 3: Statistics of PCC-Expr

Start at: 2019-01-21 10:31:00
End at: 2019-01-21 10:31:30
Local clock offset: -6.489 ms
Remote clock offset: 6.469 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.39 Mbit/s
95th percentile per-packet one-way delay: 4158.672 ms
Loss rate: 80.52%
-- Flow 1:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 317.297 ms
Loss rate: 57.14%
-- Flow 2:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 909.386 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 1.17 Mbit/s
95th percentile per-packet one-way delay: 4159.303 ms
Loss rate: 80.56%
```

Run 3: Report of PCC-Expr — Data Link





Run 1: Statistics of QUIC Cubic

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of QUIC Cubic — Data Link

Figure is missing

Figure is missing

Run 2: Statistics of QUIC Cubic

```
/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows
```

Run 2: Report of QUIC Cubic — Data Link

Figure is missing

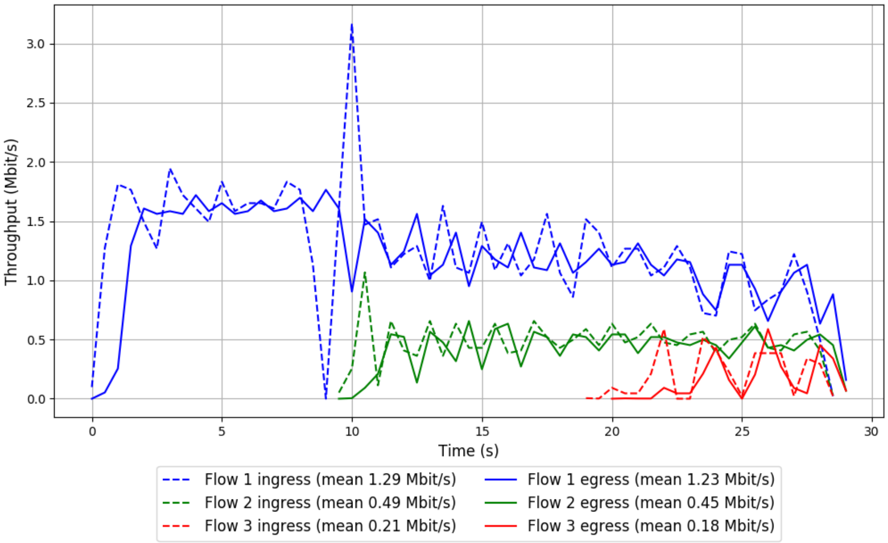
Figure is missing

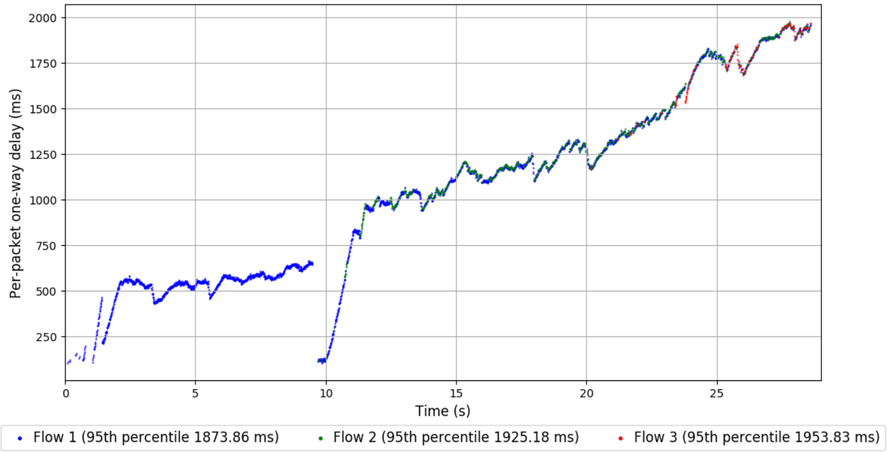
```
Run 3: Statistics of QUIC Cubic

Start at: 2019-01-21 10:22:23
End at: 2019-01-21 10:22:53
Local clock offset: -4.273 ms
Remote clock offset: 7.29 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.58 Mbit/s
95th percentile per-packet one-way delay: 1890.284 ms
Loss rate: 6.35%
-- Flow 1:
Average throughput: 1.23 Mbit/s
95th percentile per-packet one-way delay: 1873.859 ms
Loss rate: 4.50%
-- Flow 2:
Average throughput: 0.45 Mbit/s
95th percentile per-packet one-way delay: 1925.182 ms
Loss rate: 9.92%
-- Flow 3:
Average throughput: 0.18 Mbit/s
95th percentile per-packet one-way delay: 1953.830 ms
Loss rate: 23.78%
```

Run 3: Report of QUIC Cubic — Data Link





Run 1: Statistics of SCReAM

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of SCReAM — Data Link

Figure is missing

Figure is missing

Run 2: Statistics of SCReAM

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 2: Report of SCReAM — Data Link

Figure is missing

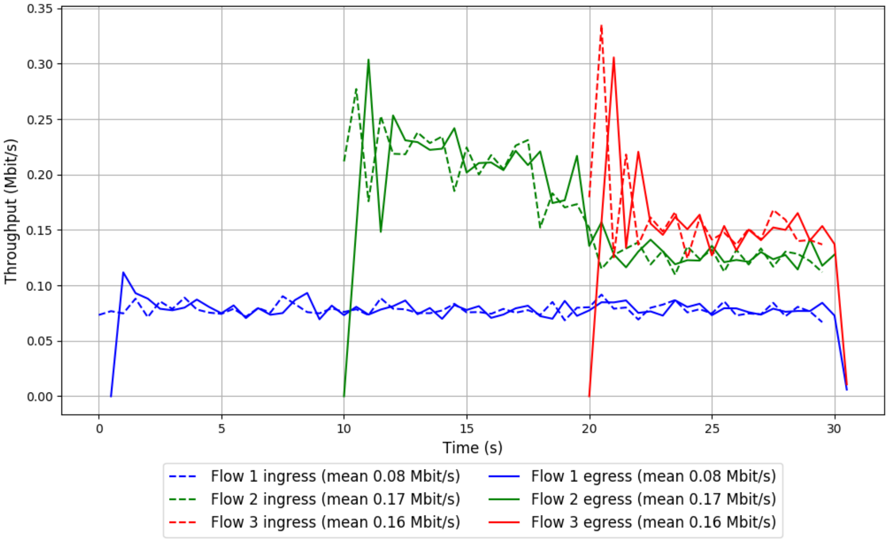
Figure is missing

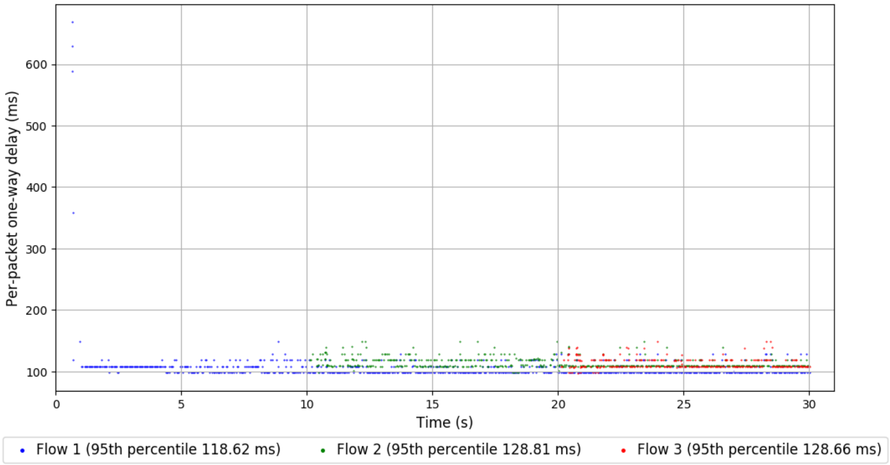
```
Run 3: Statistics of SCReAM

Start at: 2019-01-21 10:16:15
End at: 2019-01-21 10:16:45
Local clock offset: -2.114 ms
Remote clock offset: 3.219 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.25 Mbit/s
95th percentile per-packet one-way delay: 128.659 ms
Loss rate: 0.14%
-- Flow 1:
Average throughput: 0.08 Mbit/s
95th percentile per-packet one-way delay: 118.622 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.17 Mbit/s
95th percentile per-packet one-way delay: 128.810 ms
Loss rate: 0.15%
-- Flow 3:
Average throughput: 0.16 Mbit/s
95th percentile per-packet one-way delay: 128.663 ms
Loss rate: 0.33%
```

Run 3: Report of SCReAM — Data Link





Run 1: Statistics of Sprout

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of Sprout — Data Link

Figure is missing

Figure is missing

```
Run 2: Statistics of Sprout

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows
```

Run 2: Report of Sprout — Data Link

Figure is missing

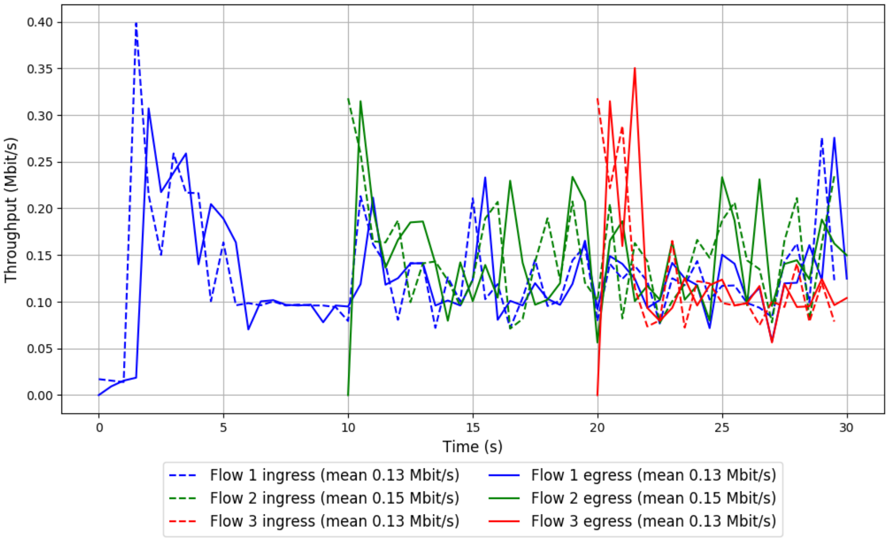
Figure is missing

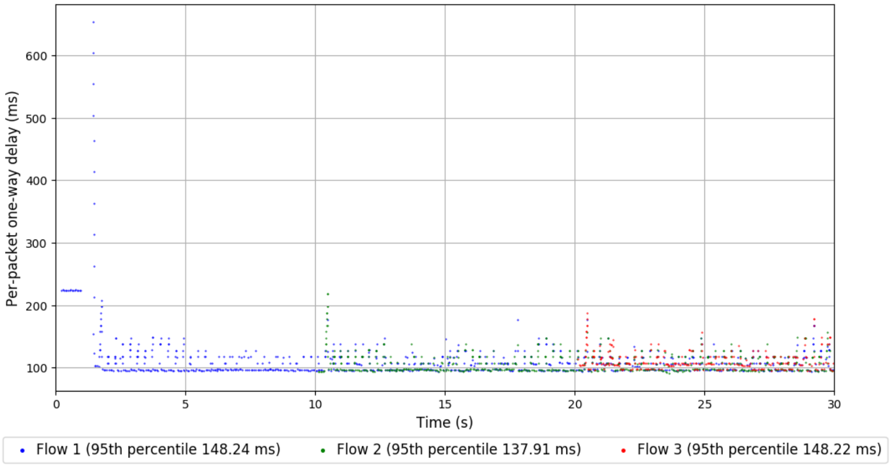
```
Run 3: Statistics of Sprout

Start at: 2019-01-21 10:18:42
End at: 2019-01-21 10:19:12
Local clock offset: -2.673 ms
Remote clock offset: 3.024 ms

# Below is generated by plot.py at 2019-01-21 10:39:25
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.27 Mbit/s
95th percentile per-packet one-way delay: 147.658 ms
Loss rate: 0.56%
-- Flow 1:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 148.243 ms
Loss rate: 0.02%
-- Flow 2:
Average throughput: 0.15 Mbit/s
95th percentile per-packet one-way delay: 137.905 ms
Loss rate: 1.45%
-- Flow 3:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 148.221 ms
Loss rate: 0.06%
```

Run 3: Report of Sprout — Data Link





```
Run 1: Statistics of TaoVA-100x

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows
```

Run 1: Report of TaoVA-100x — Data Link

Figure is missing

Figure is missing

`Run 2: Statistics of TaoVA-100x`

`/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows`

Run 2: Report of TaoVA-100x — Data Link

Figure is missing

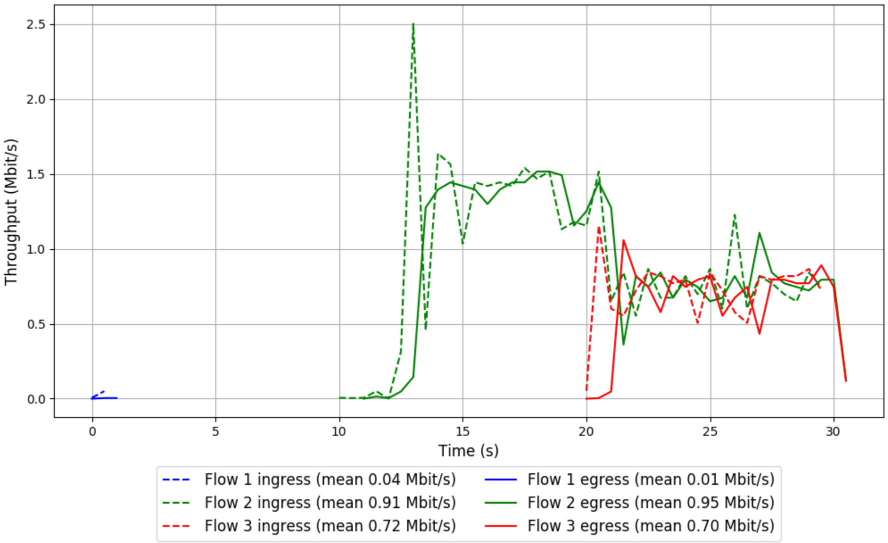
Figure is missing

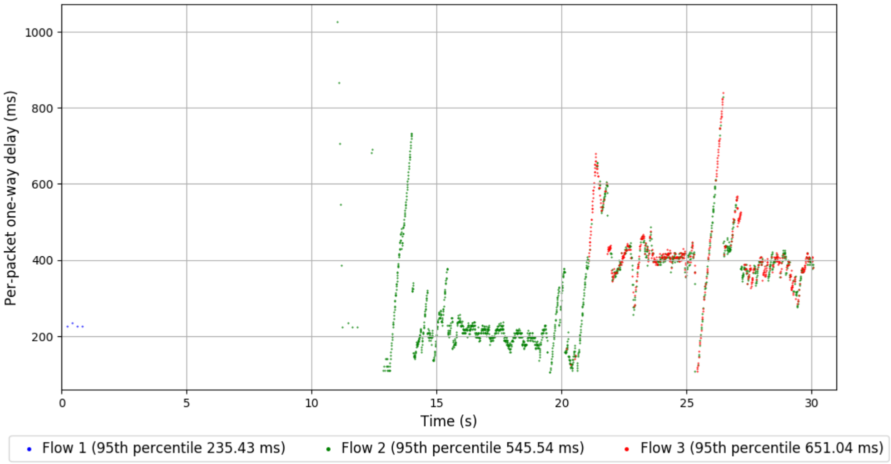
```
Run 3: Statistics of TaoVA-100x

Start at: 2019-01-21 10:15:01
End at: 2019-01-21 10:15:31
Local clock offset: -1.331 ms
Remote clock offset: 2.932 ms

# Below is generated by plot.py at 2019-01-21 10:39:26
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.83 Mbit/s
95th percentile per-packet one-way delay: 589.596 ms
Loss rate: 1.90%
-- Flow 1:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 235.429 ms
Loss rate: 85.45%
-- Flow 2:
Average throughput: 0.95 Mbit/s
95th percentile per-packet one-way delay: 545.536 ms
Loss rate: 0.93%
-- Flow 3:
Average throughput: 0.70 Mbit/s
95th percentile per-packet one-way delay: 651.039 ms
Loss rate: 4.04%
```

Run 3: Report of TaoVA-100x — Data Link





Run 1: Statistics of TCP Vegas

```
/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows
```

Run 1: Report of TCP Vegas — Data Link

Figure is missing

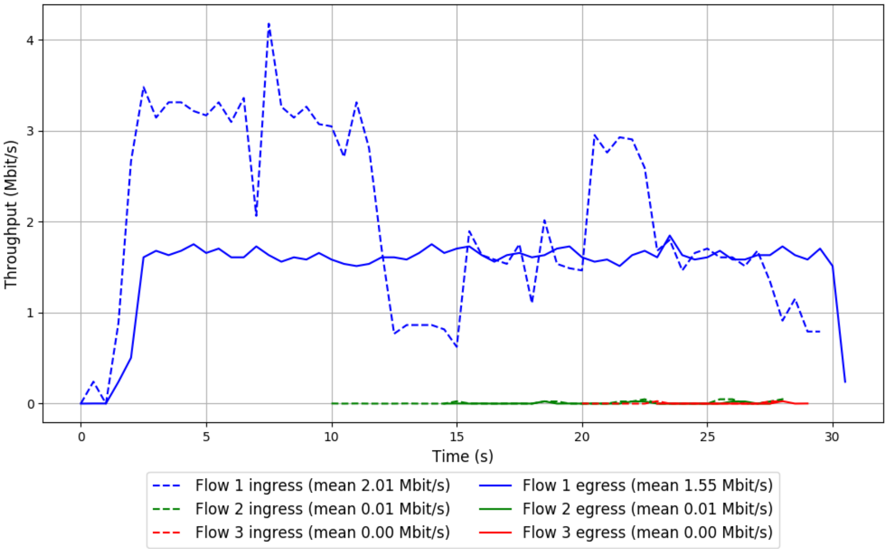
Figure is missing

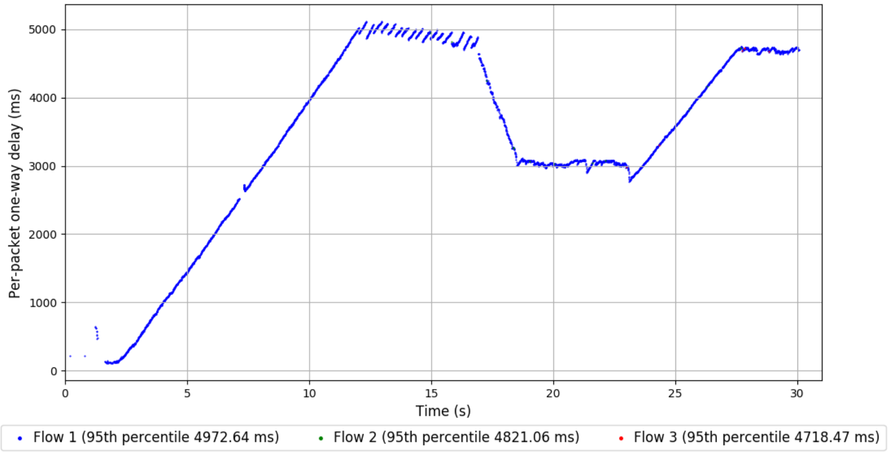
```
Run 2: Statistics of TCP Vegas

Start at: 2019-01-21 10:08:52
End at: 2019-01-21 10:09:22
Local clock offset: -1.658 ms
Remote clock offset: 3.122 ms

# Below is generated by plot.py at 2019-01-21 10:39:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.55 Mbit/s
95th percentile per-packet one-way delay: 4972.634 ms
Loss rate: 23.34%
-- Flow 1:
Average throughput: 1.55 Mbit/s
95th percentile per-packet one-way delay: 4972.642 ms
Loss rate: 23.24%
-- Flow 2:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 4821.060 ms
Loss rate: 48.72%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 4718.468 ms
Loss rate: 61.79%
```

Run 2: Report of TCP Vegas — Data Link



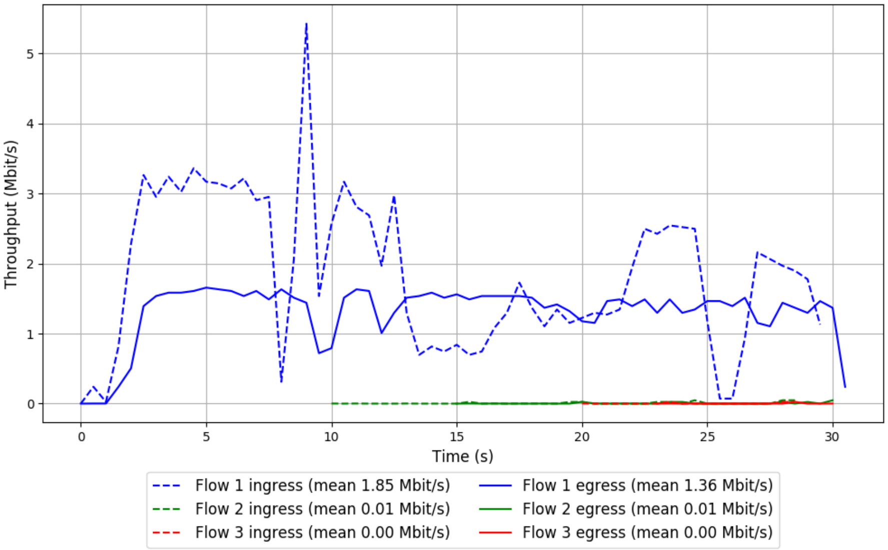


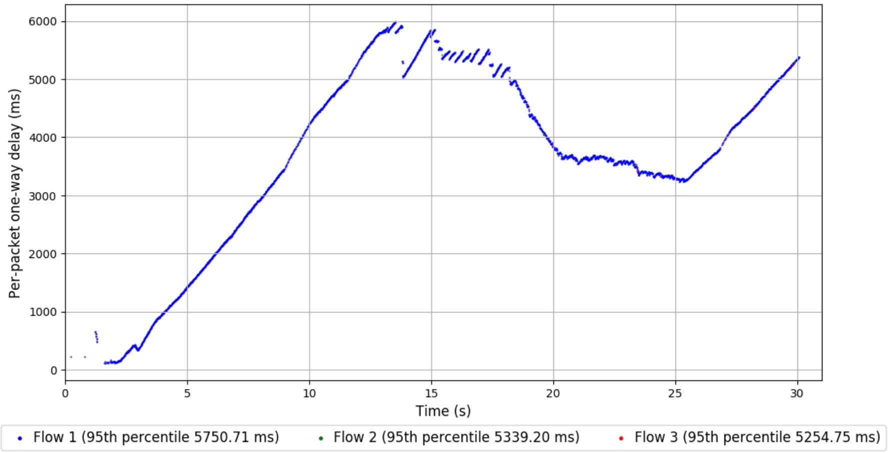
```
Run 3: Statistics of TCP Vegas

Start at: 2019-01-21 10:34:40
End at: 2019-01-21 10:35:10
Local clock offset: -7.783 ms
Remote clock offset: 7.478 ms

# Below is generated by plot.py at 2019-01-21 10:39:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.36 Mbit/s
95th percentile per-packet one-way delay: 5749.623 ms
Loss rate: 27.06%
-- Flow 1:
Average throughput: 1.36 Mbit/s
95th percentile per-packet one-way delay: 5750.709 ms
Loss rate: 27.01%
-- Flow 2:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 5339.202 ms
Loss rate: 35.01%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 5254.752 ms
Loss rate: 61.12%
```

Run 3: Report of TCP Vegas — Data Link





Run 1: Statistics of Verus

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of Verus — Data Link

Figure is missing

Figure is missing

Run 2: Statistics of Verus

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 2: Report of Verus — Data Link

Figure is missing

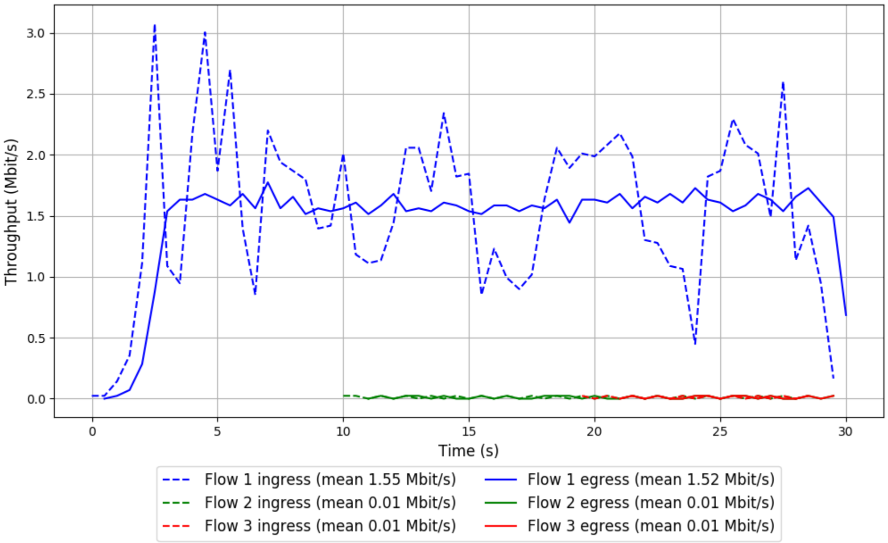
Figure is missing

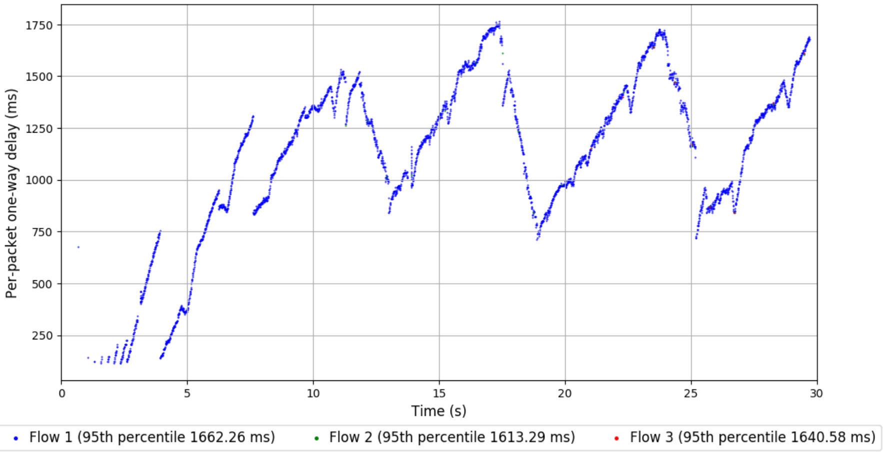
```
Run 3: Statistics of Verus

Start at: 2019-01-21 10:21:09
End at: 2019-01-21 10:21:39
Local clock offset: -4.735 ms
Remote clock offset: 6.874 ms

# Below is generated by plot.py at 2019-01-21 10:39:28
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.53 Mbit/s
95th percentile per-packet one-way delay: 1662.241 ms
Loss rate: 3.93%
-- Flow 1:
Average throughput: 1.52 Mbit/s
95th percentile per-packet one-way delay: 1662.260 ms
Loss rate: 3.91%
-- Flow 2:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 1613.288 ms
Loss rate: 5.00%
-- Flow 3:
Average throughput: 0.01 Mbit/s
95th percentile per-packet one-way delay: 1640.579 ms
Loss rate: 10.00%
```

Run 3: Report of Verus — Data Link





Run 1: Statistics of PCC-Vivace

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of PCC-Vivace — Data Link

Figure is missing

Figure is missing

Run 2: Statistics of PCC-Vivace

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 2: Report of PCC-Vivace — Data Link

Figure is missing

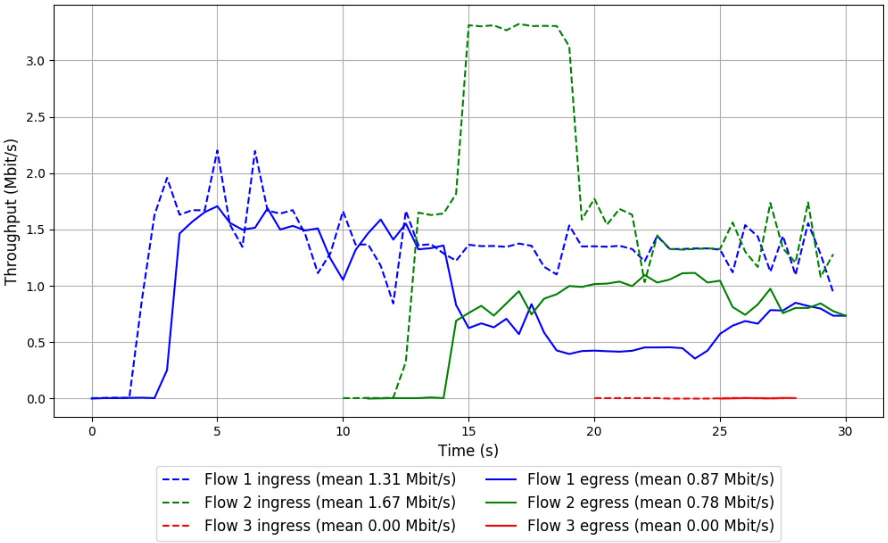
Figure is missing

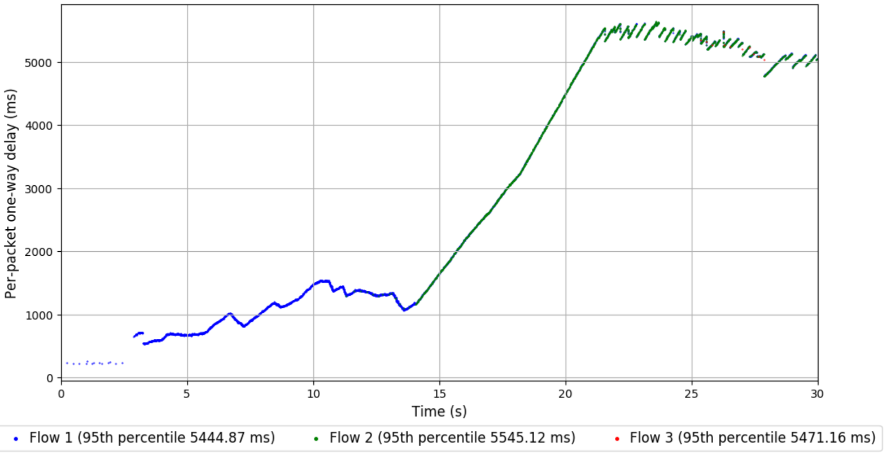
```
Run 3: Statistics of PCC-Vivace

Start at: 2019-01-21 10:24:50
End at: 2019-01-21 10:25:20
Local clock offset: -5.087 ms
Remote clock offset: 6.928 ms

# Below is generated by plot.py at 2019-01-21 10:39:29
# Datalink statistics
-- Total of 3 flows:
Average throughput: 1.36 Mbit/s
95th percentile per-packet one-way delay: 5506.794 ms
Loss rate: 44.28%
-- Flow 1:
Average throughput: 0.87 Mbit/s
95th percentile per-packet one-way delay: 5444.873 ms
Loss rate: 34.11%
-- Flow 2:
Average throughput: 0.78 Mbit/s
95th percentile per-packet one-way delay: 5545.123 ms
Loss rate: 56.28%
-- Flow 3:
Average throughput: 0.00 Mbit/s
95th percentile per-packet one-way delay: 5471.163 ms
Loss rate: 49.43%
```

Run 3: Report of PCC-Vivace — Data Link





Run 1: Statistics of WebRTC media

/home/ubuntu/pantheon/data/2019-01-21T09-12-AWS-Brazil-2-to-Colombia-cellular-3-runs-3-flows

Run 1: Report of WebRTC media — Data Link

Figure is missing

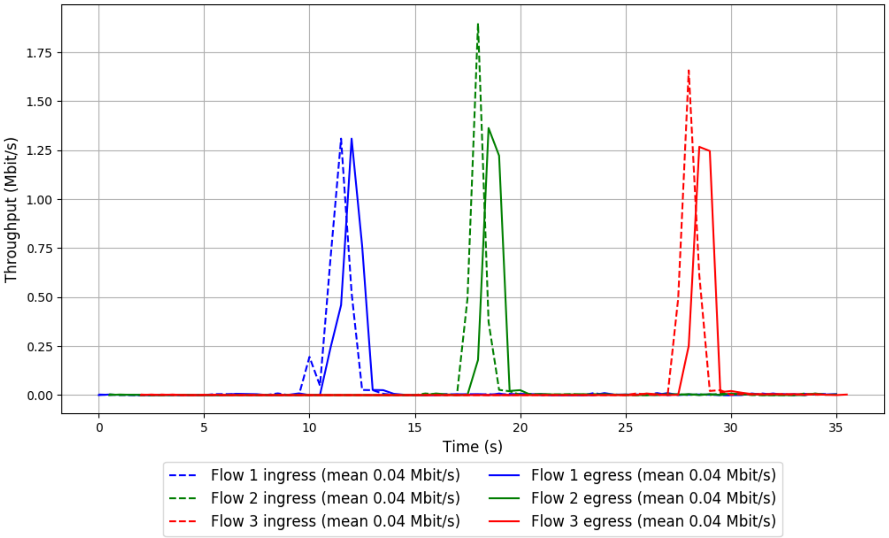
Figure is missing

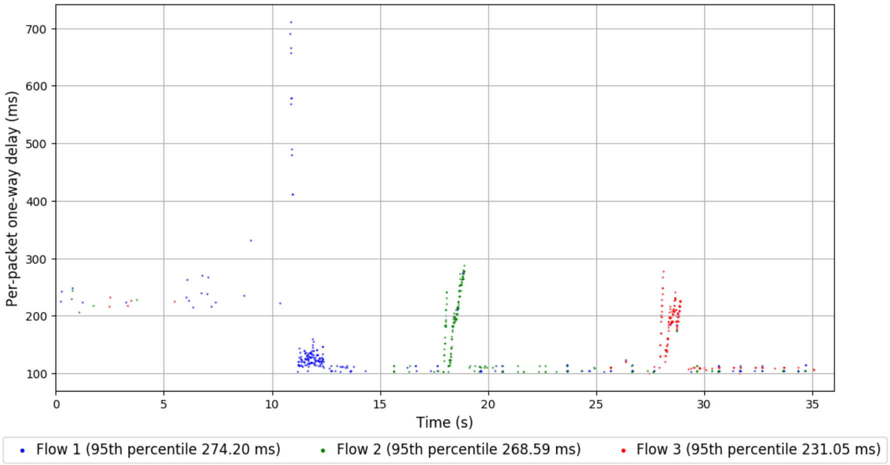
```
Run 2: Statistics of WebRTC media

Start at: 2019-01-21 10:07:39
End at: 2019-01-21 10:08:09
Local clock offset: -2.574 ms
Remote clock offset: 6.307 ms

# Below is generated by plot.py at 2019-01-21 10:39:29
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 264.233 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 274.205 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 268.589 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 231.054 ms
Loss rate: 0.00%
```

Run 2: Report of WebRTC media — Data Link



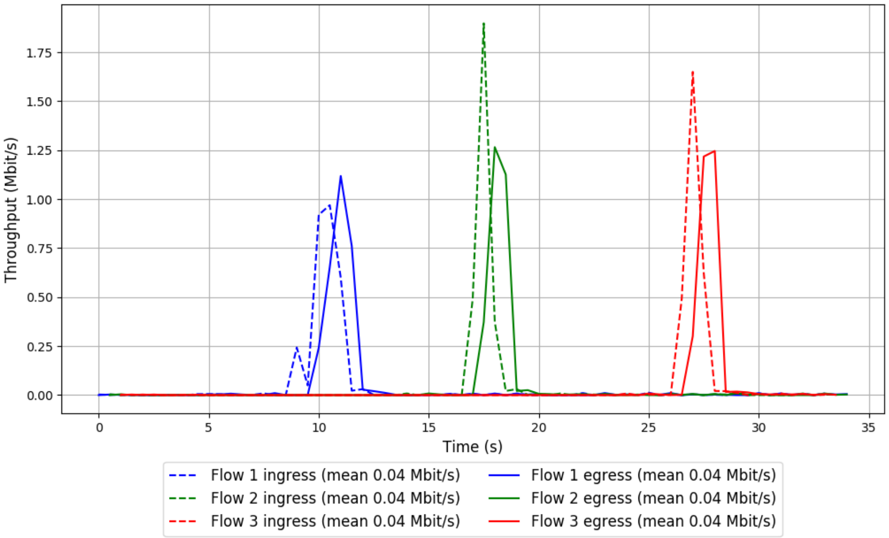


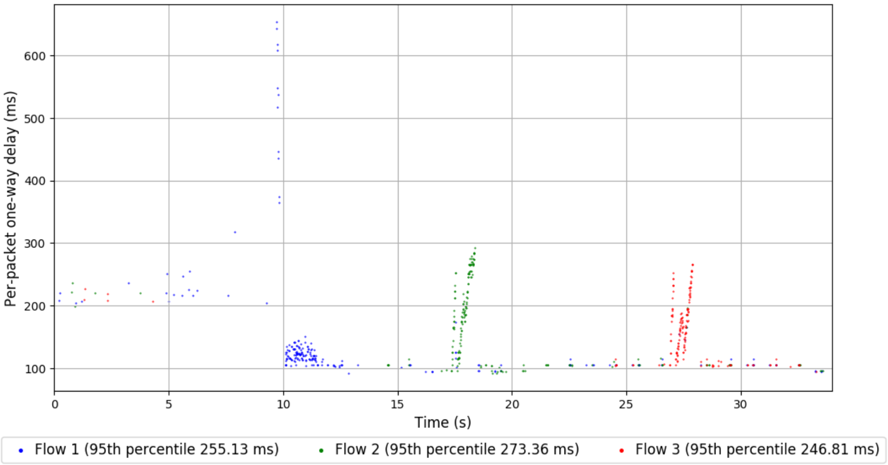
```
Run 3: Statistics of WebRTC media

Start at: 2019-01-21 10:33:27
End at: 2019-01-21 10:33:57
Local clock offset: -7.62 ms
Remote clock offset: 3.638 ms

# Below is generated by plot.py at 2019-01-21 10:39:29
# Datalink statistics
-- Total of 3 flows:
Average throughput: 0.13 Mbit/s
95th percentile per-packet one-way delay: 265.557 ms
Loss rate: 0.00%
-- Flow 1:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 255.126 ms
Loss rate: 0.00%
-- Flow 2:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 273.363 ms
Loss rate: 0.00%
-- Flow 3:
Average throughput: 0.04 Mbit/s
95th percentile per-packet one-way delay: 246.805 ms
Loss rate: 0.00%
```

Run 3: Report of WebRTC media — Data Link


Throughput (Mbit/s)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0
5
10
15
20
25
30
35
Time (s)
Flow 1 ingress (mean 0.04 Mbit/s)
Flow 2 ingress (mean 0.04 Mbit/s)
Flow 3 ingress (mean 0.04 Mbit/s)
Flow 1 egress (mean 0.04 Mbit/s)
Flow 2 egress (mean 0.04 Mbit/s)
Flow 3 egress (mean 0.04 Mbit/s)


Per-packet one-way delay (ms)
600
500
400
300
200
100
0
5
10
15
20
25
30
Time (s)
Flow 1 (95th percentile 255.13 ms)
Flow 2 (95th percentile 273.36 ms)
Flow 3 (95th percentile 246.81 ms)